Railway Mechanical Engineer

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A new feature

Frequent reference has been made in the *Railway Mechanical Engineer* to the necessity on the part of those who are interested in improved leadership ability of keeping in touch with the latest and best thought on this question. One of the most significant developments of the period since the world war is the great interest which has been shown in matters dealing with better supervision and improved relations between managements and employees. Incidentally, this interest is clearly reflected in many ways, including stabilization of employment, improved working conditions and surroundings, greater efficiency and more economical production. A number of books have recently been published, or are in course of preparation, dealing with improved industrial relations, supervision, and things of that sort. Beginning with this number of the *Railway Mechanical Engineer,* it is the purpose, for a time at least, to publish regularly once a month a more or less extended review of one of these books, which we believe may be of special interest to our readers. The book discussed this month, "The New Leadership in Industry," is just off the press. An expression from our readers as to whether a feature of this sort will be helpful to them, with suggestions as to the particular classes of books which they would like to see covered in this way, will be appreciated.

Getting the "safety first" idea over

Carelessness and thoughtlessness on the part of employees in all industries are the two principal reasons why we hear so much about "safety first." The railroad industry has its share of negligent employees in whom must be firmly planted the idea of protecting not only their own interests, but also those of their fellow workmen. That satisfactory results in a safety campaign can be obtained in what is considered the most hazardous type of railroad shop was clearly explained in an article in the August issue of the *Railway Mechanical Engineer,* which described the methods whereby the total number of lost time accidents for 1925 were limited to 191 in the Enola steel freight car shop of the Pennsylvania System. It is true that the railroads of this country believe in educating their employees to the idea of self-protection. Committees have been appointed and intensive campaigns have been inaugurated, but the net results in many cases have not been entirely satisfactory. The underlying reason for these inadequate results is that the committee itself cannot put over a safety campaign in a particular shop unless the officer in charge of the shop is thoroughly sold to the idea of the safety movement. The foreman may placard his shop with catchy signs and clever sayings, but they will not register with the men unless they know that the "boss" is wholeheartedly behind the purpose of the signs and that he will "fire" any man who is persistently careless and negligent. If the officer in charge of the shop is a leader of men and understands human nature, he can make a safety campaign a complete success. On the other hand if he is not this type the success of the movement is doubtful, for his effort will be half-hearted and poorly suited to inspire a belief in the seriousness of the movement in the minds of the employees under his supervision.

Foremen's clubs

The survey of what has been done by the mechanical departments of the railroads to bring up the standards of supervision and improve the leadership ability of the officers and supervisors, which was published in the June number of the *Railway Mechanical Engineer,* has brought forth a number of inquiries as to the best form of organization of foremen's clubs and the subjects which can be considered to advantage by such clubs. The survey mentioned a number of railroads on which foremen's clubs have been organized and made some brief comment about the accomplishments of the clubs. A similar survey, published in the June, 1925, number of the *Railway Mechanical Engineer,* did go somewhat more thoroughly into the programs and procedure of a few of the clubs which were functioning at that time. To meet the needs of those who are now looking for more complete and specific information about such clubs, two articles will be found on other pages of this issue.

One of these, by J. M. Ganley, describes in some detail the form of organization and the programs which have been followed to excellent advantage by the Decatur, Ill., and Moberly, Mo., supervisors' clubs of the Wabash Railway. Another article, entitled "Making Foreman Training a Reality," by C. Y. Thomas, supervisor of apprentices of the Kansas City Southern, discusses the shortcomings of some of the foremen's clubs and makes definite recommendations not only as to the type of subjects which should be considered, but as to certain methods of procedure. It is obvious that Mr. Thomas is tremendously interested in making the work of these clubs more effective, because he has a vision of the wonderful possibilities which are involved. On the other hand, it is altogether likely that some of our readers will disagree with certain of his suggestions, such as having formal examinations and compulsory attendance. The fact must not be lost sight of, and this is said with no intention of minimizing the importance of the practical and helpful information which is developed at foremen's club meetings, that the get-together

feature of such clubs is one of their most important assets.

Will this be adversely affected by making the meetings too formal? Are examinations necessary? Are there less obnoxious but equally effective ways of checking up, or helping the class or club members to get the greatest amount of practical good from the organization? Will the supervisors profit more from a voluntary form of organization which is entirely conducted or promoted by themselves, as compared to a company-promoted type of class or club? Is something wrong with the supervisors when it becomes necessary to check them up and deal with them on the same basis as high school students?

These questions are asked with no idea of casting reflection on the splendid article by Mr. Thomas, which contains a number of most helpful suggestions, but rather to stimulate thinking and promote discussion on this question of improving leadership ability, which promises to be the most important development in the railway mechanical field in the months to come.

Why not attend the conventions?

The several organizations of railroad mechanical department supervisors including traveling engineers, railway general foremen, master painters, master blacksmiths, chief interchange car inspectors and car foremen, tool foremen and steel treaters have prepared programs for their respective fall conventions, as shown elsewhere in this issue, which are practically without exception far ahead of any such previous attempts. Both in the calibre of the speakers obtained and quality of the reports to be presented, they are highly creditable to the association officers responsible. A tremendous amount of work in the aggregate is involved in preparing for these conventions, most of which is done by a faithful few among the officers and executive committee members. How far reaching will be the benefits, remains to be seen. Maximum results cannot be expected without a large attendance of members who actively participate in the meetings.

Many reasons can be devised for non-attendance at the conventions. Some traveling engineer, general foreman, car foreman or other supervisor may feel that he is too busy to get away. In some cases, the roads are unwilling to provide more than the transportation, and the supervisors feel that they cannot afford to go. In still other cases, the supervisors are just simply uninterested.

The answer to the first objection is that the supervisors who have not developed subordinates capable of carrying on their work for two or three days, or as long as the convention may last, have failed signally in the first important element of their task which is developing men. The answer to the second objection is that faithful and earnest supervisors pick up information at conventions which benefits their respective roads in amounts far exceeding the cost of sending them to the conventions. Supervisors who are not faithful and earnest should not be sent. Doubt in the minds of mechanical department heads regarding the value of convention attendance by subordinates can be solved by requiring individual reports which serve not only as a check on the supervisors attendance and keen attention at meetings but assist materially in crystalizing the ideas which he may pick up regarding new and desirable practices.

With regard to the third reason or explanation for non-attendance at conventions it cannot be gainsaid that the road whose mechanical department supervisors have no interest in meeting their fellows, exchanging ideas, and hearing about improved methods, is most unfortunate. The mechanical supervisory officers have this year developed programs which are constructive and instructive, exceeding in potential value, in many cases, any previously developed. The way for the railroads to capitalize fully on these conventions is to encourage a general attendance of the officers interested, require active participation, and insist on written reports as to information gained.

Steel Treaters' convention

The annual meeting of the American Society for Steel Treating, a program of which appears on another page of this issue, will be held this year at the Municipal Pier, Chicago, the week of September 20, bringing together again the greatest company of experts in the manufacture, treatment and use of steel in this country, if not in the world. In fact a considerable number of authorities from abroad will be present to read papers and participate in the discussions. As usual, a splendid display of various kinds of steel, steel treating equipment and methods will be available at the exhibit, enabling visitors to see the latest developments in the important art of steel handling. Railroad mechanical men should capitalize fully on the opportunity which attendance at this convention affords to increase their knowledge of steel and its proper treatment. Railroads have in the past adhered quite generally to the use of carbon steel and it is regrettable to have to say that many locomotive and car shops are not equipped for the proper treatment of carbon steel, to say nothing of the heat treatment of alloy steels so as to bring out the highly desirable properties of strength, relatively light weight, and wear resistance which they afford. Attendance at the convention will do much to show the improvements needed to bring steel handling practices in the average railroad shop up to modern standards. There will also be a large exhibit of machine tools under the auspices of the National Steel & Machine Tool Exposition which will warrant the attendance of all those interested in this class of railroad equipment. The impression is altogether too general, and there is altogether too much justification for it, that the average railroad shop is a back number, when it comes to treating steel. Why not get some wide awake mechanical department officers out to this convention and see what modern practices in the specification and treatment of steel lend themselves to railroad needs.

Employee representation

It became quite apparent to many people, even before the World War, that something was seriously wrong in the relations between employees and managements of industries in this country. Not a few expressed the belief that the interests of labor and capital were so far apart that they could never get together. On the other hand, there were some progressive leaders, at least, who believed that a wiser type of leadership could be developed on both sides, so that some way could be found of adjusting differences on the basis of the practical application of the Golden Rule. The World War, and the taking over of the operation of the railroads by the government, brought about the most unusual conditions in the railroad mechanical departments, so far as relations with employees were concerned. The problem was passed on to the managements when the railroads were returned to their owners and finally culminated in a catastrophe in July, 1922—the shop crafts strike.

Shortly after the war, many industries began to look

into the merits of employee representation as a means of bringing about better relations with the employees and promoting their mutual interests. The train service organizations on the Pennsylvania System worked out with the management a mutually satisfactory application of this idea, and prior to the shopmen's strike in 1922, the plan was carried over into the mechanical department of that system. Almost exactly four years ago, about September 1, several of the railroads which had refused to deal with the strikers and had built up new shop craft forces, turned to employee representation as the most logical means of dealing with these employees. Four years have elapsed since the new course was embarked upon and today both managements and employees on these roads are enthusiastic over the outcome. Never has there been such delightful and hearty co-operation and understanding.

Space will not permit going into details as to the results which have been accomplished or the differences in detail methods which have been followed on the various railroads. There has been a marked improvement in stability of employment. There has been a quite remarkable increase in efficiency because of the helpful suggestions from the workers and more prompt adjustment of misunderstandings, and there has been a great improvement in working conditions and surroundings. These things, indeed, have been characteristic of the successful application of employee representation to industries in general in this country.

Observers from abroad who have sought to find the reason for American industrial prosperity have returned home with glowing accounts of our industrial conditions. One of the things that has made a most pronounced impression is the application of the employee representation plan, which differs considerably from what has been done abroad. British industries, in particular, are apparently adopting the American plan. At least this impression is given by an article in the national American weekly newspaper, "Labor," in its August 21 issue. Considerable space is given to an article headed, "Company Unions Being Organized in Great Britain—Plan Imported from America since Collapse of the General Strike." The first paragraph of the article, which is dated London, August 15, reads thus: "'Mr. British Employer, meet Mr. American Company Union.' That is an introduction which is being busily pushed here. It is an interesting afterbirth of the general strike."

In commenting upon the extent to which the idea is spreading, in England, the statement is made, "Even the liberal Manchester Guardian, much the best paper in Britain, which is strongly pro-labor in industrial disputes and mildly so in politics, is engineering a company union." The article closes with the statement that the secretary of the Trades Union Congress "will welcome from American unions any special reports or other information on the wiles and failures of U. S. A. company unions encountered by them. Particularly, they are anxious to combat any accounts of 'successes' which may be advertised here by the coming U. S. A. company union propagandists."

Whether employee representation will work out as well in England with its rigid class system as it does in this country, with its broader opportunities and comparative lack of class distinctions, is a question. It must be remembered, also, that employee representation can be made a success only when a spirit of frankness and square dealing is religiously observed. The manager or employer who thinks he can utilize it to put something over on his employees or take advantage of them, has another guess coming. In other words, while it is important that the methods employed be based upon a few fundamental principles, the real thing that vitalizes the movement and makes it a success is the spirit behind it. This has been recognized on American railroads and in American industries, which have turned to employee representation in recent years, not as a panacea for all of their troubles, but as one means of bringing about better understandings and putting the relations between the employer and employee on a sound, logical basis.

New Books

THE ENGINEERING INDEX, 1925. *792 pages, 7 in. by 9½ in. Bound in cloth. Published by the American Society of Mechanical Engineers, 29 West 39th Street, New York. Price $7, to members $6.*

The Engineering Index published each year by the American Society of Mechanical Engineers has for years been considered a necessary reference book by those who wish to keep in touch with current engineering literature. It is always a welcome edition to an engineering library. Even those who have occasion to consult it only occasionally appreciate its value and completeness when they find it necessary to investigate any of the numerous subjects covered.

The first volume of the Index appeared in 1892 and it has been published annually since 1906. Up to 1918 it was prepared and published by the Engineering Magazine Company, but since that time by the American Society of Mechanical Engineers. This volume, numbering nearly 800 pages, includes some 18,000 items which appear in engineering and other technical publications and more than 3,000 of these items are cross-references. Many 1924 publications received too late for inclusion in the 1924 Engineering Index as well as periodicals in 1925, which were received as late as February 1, 1925, are included in this volume. In the preparation of the index, the staff of the society reviewed more than 1,200 periodicals, reports and other publications regularly received during the year by the Engineering Societies Library, New York. The railway field, both steam and electric, is covered.

THE METALLURGY OF ALUMINIUM AND ALUMINIUM ALLOYS. *By Robert J. Anderson, B. Sc., Met. E., Consulting metallurgical engineer. Bound in cloth, 6¼ in. by 9¼ in. 913 pages, illustrated. Published by Harry Carey Baird & Co., Inc., New York. Price $10.00 net.*

This volume is an entirely new work and is said to be the only complete modern volume written on this subject. It contains 19 chapters and nearly 300 illustrations, supplemented by tables and charts. While the book is written primarily with a view to being practical, the more theoretical aspects have not been neglected. The average layman will find the introductory and second chapters to be quite interesting. These chapters give a historical survey of the aluminium industry and an account of where the various aluminium ores are found and how they are mined. Chapter three goes into the various phases of aluminium production. The remaining chapters explain the various processes used in making aluminium alloys, their uses and applications, aluminium-alloy melting practice, foundry practice and allied subjects relative to fabrication, etc.

The volume is a thorough and comprehensive treatise on the metallurgy of aluminium and its light alloys, covering the subject from the mixing of the ores to the fabrication of the metal including its application and uses. The author is a well-known consulting metallurgical engineer and specialist on aluminium, whose experience covers many years in the industry.

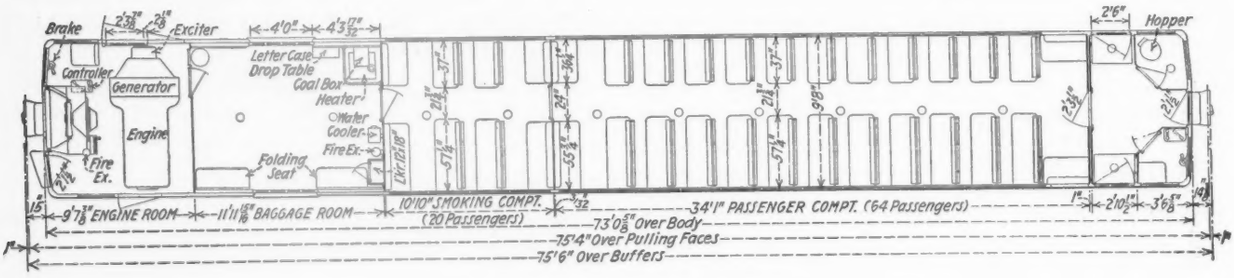
One of the 73-ft. rail motor cars built for the Boston & Maine by the Osgood Bradley Car Company.

Rail motor cars of all-steel construction

New equipment for Boston & Maine designed for long runs in main or branch line service

THE first car of an order of ten rail motor cars was recently delivered to the Boston & Maine by the Osgood-Bradley Car Company, Worcester, Mass. The complete delivery of this order will make a total of 24 rail motor cars in service on that road. All of the ten cars are identical in their equipment, details of construction and power plant, except that two cars have a length over the body of 73 ft. 5/8 in., while the remaining eight have a body length of 61 ft. 5/8 in. The 73-ft. cars are intended for service on runs where the traffic does not require the use of trailers. They are a complete passenger unit in themselves, having both passenger and smoking compartments in addition to baggage space, as shown in the drawing of the floor plan of this car. The 61-ft. cars, however, are designed for trailer service and nine standard coaches are now being prepared for this service, with the same features of interior color design, car heating equipment and seats, together with mail compartments, baggage space and other details which are necessary for self-contained train service. The passenger compartment in the 61-ft. motor car serves as a smoker when trailers are used. The new cars are to be used on various divisions of the Boston & Maine on runs each approximating 200 miles a day. One of these cars is to be operated on a schedule that requires a daily run of 350 miles. In some cases the new equipment will replace other motor cars which will be assigned to less important runs while several of the new rail motor cars will replace steam locomotive train service.

Both the 73-ft. and 61-ft. cars are equipped with the same type of power units and control apparatus. Owing to the fact that these cars are to be operated in main line traffic, the designers selected a power plant that would provide plenty of capacity to make a quick get-away from stations and also travel at a high rate of speed for short or long distances as required. Although the 73-ft. cars are not designed for trailer service, sufficient capacity is provided to handle trailers when the traffic makes it necessary.



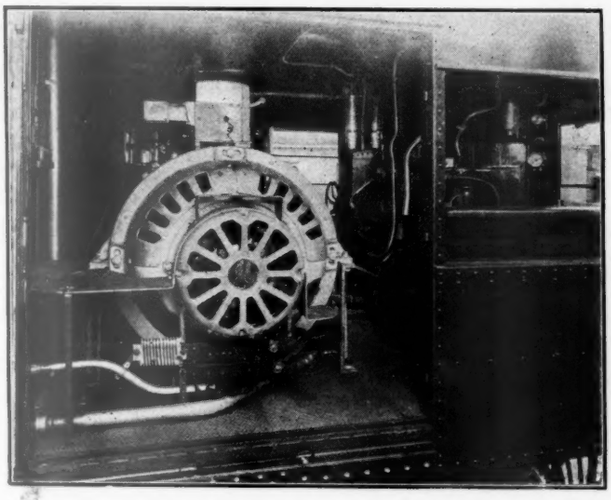
Floor plan of the 73-ft. rail motor car

Engine designed to operate on distillate

The power plant which was furnished by the Electro-Motive Company, Cleveland, Ohio, consists of a six-cylinder Winton gas engine which is designed to operate on a low grade fuel oil, such as distillate. The engine develops 275 hp. at 1,000 r.p.m. and has 7½-in. by 8½-in. cylinders. It is directly coupled to a General Electric direct-current generator which has an output of 180 kw. at 1,000 r.p.m. The engine and generator are mounted on a cast-steel bed plate secured to the underframe and is supported so as to minimize vibrations to the passenger compartment. Two dual ignition Bosch magnetos provide an ignition service of four plugs to each cylinder. Duff carburetors designed to handle low grade fuel

are applied on all ten cars. In case it is desired to use a higher grade fuel than distillate, such as gasoline, the only items that have to be changed are the carburetors and manifold. Provision has been made for starting the engine either by compressed air, electric starter, or by hand.

An interesting feature in the design of the power plant



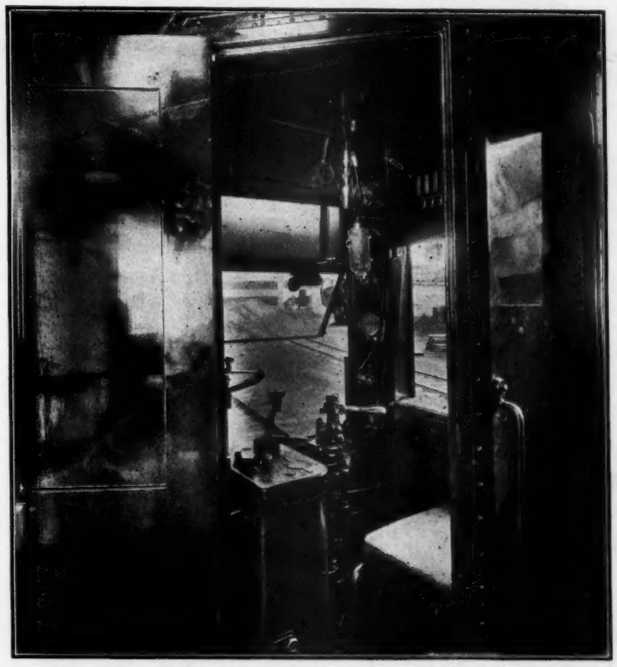
Looking into the engine room—A section of the side of the car can be removed which permits taking out the power units for repairs, if necessary

is that two radiators are employed for cooling. One of the radiators is of the automobile type and is located in the end of the car, as shown in one of the illustrations. The other radiator is located on the roof and consists

View of the front end of the 73-ft. car showing the location of the two radiators

of a series of pipes provided with fins to obtain increased radiation. A large fan draws air through the vents in the automobile type radiator and exhausts it through the radiator on the roof. Water in the radiator system, however, does not circulate through the roof unit unless the engine is running. This arrangement eliminates the possibility of the roof unit freezing up in cold weather while the car is standing idle. The hot water car heating system is also connected to the radiator system so that the end radiator can be kept warm in cold weather. This facilitates the starting of the engine, especially after it has been standing idle over night and also prevents freezing. In addition to these precautions for winter operation, a set of shutters are provided which can be fitted over the front of the end radiator.

The cars are equipped with Commonwealth cast-steel, four-wheel equalizer trucks. The motor truck has 5-in. by 9-in. journals and is equipped with special electric railway motors, self-ventilating, heavy-duty type, G.E. 254A, developing 154 hp. at 600 volts, mounted directly on the axles. The distance between wheel centers is 7 ft. The trailer truck has 4¼-in. by 8-in. journals with



Looking into the operator's cab—Both the 73-ft. and 61-ft. cars are equipped to operate from either end

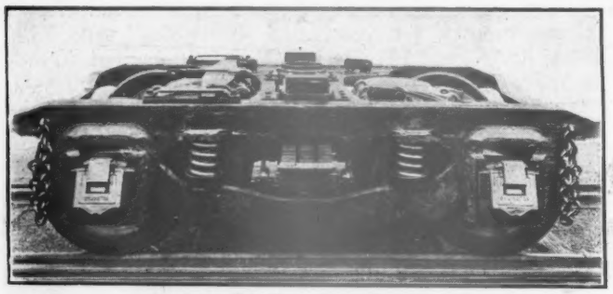
6 ft. between wheel centers. Both the 73-ft. and 61-ft. cars have 33-in. wheels.

The two 73-ft. cars are equipped with Areola heating units, while Peter Smith heating units are used on the eight 60-ft. cars. In both cases hot water is supplied to fin-type radiator pipes which are located near the floor along each side of the car in much the same manner as with the usual type piping. Approximately 5½ times as much radiation is obtained, however, with the fin-type piping as with the ordinary type. The hot water heating units are located in the baggage compartment, as shown in one of the illustrations.

Body design contains many unique features

The body design of the 61-ft. cars is the same as that of the 73-ft. cars except that the passenger compartment is used entirely for smoker service and the seats are all finished in Pantasote. The inside width is 9 ft. 8 in. and the width over the eaves is 10 ft. The height from the rail to the crown of the roof is 12 ft. 2½ in. The passenger compartments have a row of seats on one side of the car seating three persons and a similar row seating two persons on the other side with a 21¾-in. aisle space

between. The toilet is located in the vestibule, as shown in the drawing, which provides additional privacy and also locates the hopper away from the trucks. The baggage room in both the 73-ft. and 61-ft. cars have the same general equipment, consisting of two folding seats, water cooler, locker for the crew, etc., the location of which in the 73-ft. car is shown in the drawing. The baggage room for the 61-ft car, however, has a total length of 16 ft. as compared with 12 ft. for the 73-ft. car. This additional space permits the installation of an extra folding seat in the baggage room of the 61-ft. car. As shown in one of the illustrations, the ceiling is



Side view of the motor truck

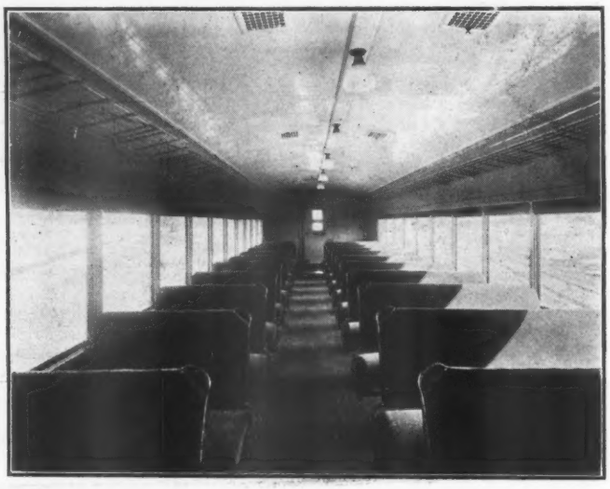
placed lower than is usually the case in passenger cars to give added efficiency in lighting and heating. The designers devoted considerable attention to making the interiors inviting to travelers. The use of narrow all-metal sash and small side posts has added much to the attractiveness of the car. This design provides an unusually large window area. The color scheme is a pleasing, leaf green enamel on the walls with the ceilings finished in light gray. The seats are of Heywood-Wakefield construction and in the rear passenger compartment are upholstered in plush dyed to a special tone of

Interior of the baggage compartment of the 73-ft. car

green to harmonize with the general color scheme. Pantasote covering is used on the smoking compartment seats. The baggage compartments are finished in a deep buff color. Durelastic flooring is used throughout. Central ceiling lighting, using rigid pendant lights with white diffusing shades, is applied in all the new cars. These fixtures, together with the reflecting surface of gray on the low ceiling, produce a well distributed light. Special attention has been given to the ventilation of cars and all are equipped with a type of ventilator manufactured by the Osgood-Bradley Car Company.

Special equipment

Each end of both the 73-ft. and 61-ft. cars are equipped with locomotive-type steel pilots. Provision is also made for the attaching of a snow plow to the pilot for winter service. The air brake equipment, is the Westinghouse schedule A.A.M. with a braking ratio of 100 per cent at 50 lb. per sq. in. cylinder-pressure on the

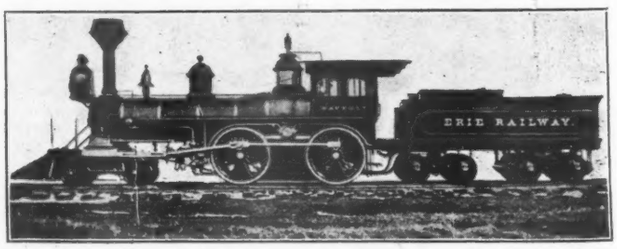


The wide windows and low ceiling of the passenger compartment add to the attractiveness of the car

motor truck and 90 per cent at 50 lb. per sq. in. cylinder-pressure on the trailer truck. Each car is also equipped with the Westinghouse pneumatic signal equipment for double-end operation. The fuel-oil tanks have a capacity of 200 gal. and are equipped with connections for filling on either side of the cars.

Comparative table of general dimensions and weights

	61 ft. car	73 ft. car
Railroad	Boston & Maine	
Builder	Osgood-Bradley Car Co.	
Length overall	63 ft. 4 in.	75 ft. 4 in.
Length of body over end frame	61 ft.	73 ft.
Length of engine room	9 ft. 6 in.	9 ft. 6 in.
Length of baggage compartment	16 ft.	12 ft.
Length of passenger compartment	28 ft. 11 in.	34 ft. 1 in.
Length of smoking compartment	— — —	10 ft. 10 in.
Length of rear vestibule and cab	5 ft. 4½ in.	6 ft. 4½ in.
Width over side sills	9 ft. 10 in.	9 ft. 10 in.
Height overall	12 ft. 7 in.	12 ft. 7 in.
Height, rail to top of roof	12 ft. 2½ in.	12 ft. 2½ in.
Height, rail to top floor	4 ft. 4 in.	4 ft. 4 in.
Truck wheel base	6 ft. trailer 7 ft. motor	6 ft. trailer 7 ft. motor
Truck centers	43 ft. 6 in.	55 ft. 6 in.
Diameter of wheels	33 in.	33 in.
Seating capacity, passenger compartment	54 ft.	64 ft.
Seating capacity, baggage compartment	11	4
Seating capacity, smoking compartment	— — —	20
Total seating capacity	65	88
Engine, h.p.	275 h.p.	275 h.p.
Fuel	Distillate	Distillate
Total weight of power unit with appurtenances	30,000 lb.	30,000 lb.
Total weight (light)	90,000 lb.	100,000 lb.



Locomotive "Waverly," built for the Erie in 1870—Diameter of drivers, 60 in., cylinders 16 in. by 24 in.

The new leadership in industry*

The first of a series of discussions of books on improved supervision and better employee relations

TO PROPERLY appraise a book one must know something at least about the author—his training, experience, environment and personality. The title page of "The New Leadership in Industry" designates the author, Sam A. Lewisohn, as vice-president of the Miami Copper Company, and chairman of the board of the American Management Association. "Who's Who in America" characterizes Mr. Lewisohn as a capitalist, but it would also appear from his various connections that he is something of an economist and philanthropist as well. He also has some reputation as a writer and speaker on industrial relations and wage problems. Those who know him personally, however, are quite likely to think of him as a broad-minded, trained thinker, who has earnestly studied to improve the condition of workers in the organizations with which he has been associated. He has also made it a point to keep in touch with those leaders in industry who have had the courage and ability to leave the beaten path in the attempt to solve what has been designated as the industrial problem. Doubtless this is one of the reasons why he was drafted for such an important position in the American Management Association and why he has exerted so great an influence in the upbuilding of that association and the extension of its activities.

A reading of Mr. Lewisohn's book, which, by the way, is attractively printed in large type, must impress even those who have not come in contact with him personally, by the frank, open-minded way in which he approaches some of the troublesome questions associated with the question of employee relations. Incidentally, the book is not intended to be an exhaustive treatise on this subject.

"The real difficulty of labor relations," says Mr. Lewisohn, "has been one of neglect. Executives have treated the question of human organization as a minor matter, not as a major problem. They have too often failed to realize that their responsibilities as assemblers and organizers of man-power are just as great as those in mechanical and financial matters." Again, in discussing the responsibility of employers, Mr. Lewisohn says: "In industrial relations a great deal has been said of the necessity of co-operation between both sides, with the implication that the managers and managed are to an equal degree responsible for the outcome. The fact is that the responsibility for bringing about sound relations between employers and employees is not equally divided. trained thinker, who has earnestly studied to improve the industrial scene is the employer."

It is difficult to sum up or outline within our space limitations the author's approach to the problem and his suggestions for the new type of leadership. He starts out by calling attention to the fact that the relations between employers and employees have been "a football of our emotions," and emphasizes the importance of the application of sound reason and common sense to the problem. There are many misconceptions as to capitalism, and the author goes to some pains to indicate that the labor problem would exist in its essentials whether we have capitalism or some other economic system. We must clear our minds of such misconceptions if we are to make real progress in improving relationships.

In emphasizing the fact that executives are not automatons of capital, Mr. Lewisohn cites an example in the railway field as follows:

"There is a prominent banking house which is interested in the Baltimore & Ohio. It is also interested in the Union Pacific. Both are very important systems. It would seem that the influence of this banking house should be similar in both railroads. But the railroads have radically different labor policies. The Baltimore & Ohio has introduced an interesting experiment in working out co-operation in the shops between union committees and managers. The Union Pacific has refused to treat with the unions and instituted an elaborate plan of employee representation. Bankers are more interested in results than in theories."

It is necessary to find and develop leaders with constructive qualities of leadership. This can be accomplished by removing certain obsessions and traditions from their minds, setting a new fashion in leadership and conceiving the training and development of leadership in broader terms. On this as a basis, Mr. Lewisohn discusses the education of the manager. His suggestions would in all likelihood start a spirited discussion in the railway field, because he draws attention to the fact that trained technical engineers are more and more being used as industrial executives, even though the average engineer is handicapped because of not having had a sufficiently broad training in industrial relations. The technical graduate, or any executive, however, even with the best of preliminary training, must continue his education in industrial relations on the job. A number of agencies are mentioned which are prepared to render assistance in various ways. Moreover, Mr. Lewisohn suggests that this country is so largely dependent upon industry that, "Continuous education of production managers to handle labor relations properly should be a general national educational policy."

Much consideration is given to the question of employee representation, with special emphasis on employee consultation. The functions of employee representation are outlined as follows:

"(a) It enables the management to interpret itself to the men, and the men to interpret their aspirations to the management. (b) It serves as a vehicle for laying the facts of the business before the workmen and thus gives each workman the realization that he is being consulted. (c) It furnishes a method of discussing wages and hours with the employees as a group and coming to an agreement concerning them. Shop committees have proved very useful in wage and piecework adjustments. (d) It increases the sense of self-importance and responsibility of each workman, and creates a feeling of identification of himself with the plant organization. (e) It has great educational value in teaching the workers self-discipline. (f) It enables the management to utilize the practical knowledge and experience of the employees. (g) Properly supplemented by careful intensive education, it gives the employees a creative concern in their work."

In discussing the harmonizing of unionism and industrial effectiveness, the author pays a high tribute to the labor unions, at the same time pointing out the limitations of the unions.

The chapter on "The Modern Employers' Wage Policies" largely revolves around the question of the living

* "The New Leadership in Industry," by Sam A. Lewisohn. Published by E. P. Dutton & Co., New York. Bound in cloth, 229 pages, 5¼ in. by 7¾ in.

wage and the national income. Obviously, only those things which are actually produced can be distributed and the term living wage is more or less of a misnomer. Enough is not now being produced and the important thing is to discover and make effective those wage policies which will do most to increase the national productivity.

The closing chapter on "The New Leadership" indicates that in broad terms the more important desires of the workman are desire for justice, desire for status and desire to have his job made a career. Incidentally, the discussion of these involves, among other things, the question of employee and consumer ownership; in discussing the question of a career, reference is also made to the handicap which prevails on the railroads under union rules of seniority. Methods suggested for satisfying the desires of the workers and promoting better relations include the installation of a personnel or industrial relations department, improved management and efficiency and a rounded-out program.

"Producing a healthy human organization within industry is dependent upon no simple panacea," says Mr. Lewisohn. "Like health in real life, a continued daily regime suited to the needs of the particular individual is what counts in the long run. *With the adoption of scientific personnel methods and an interest in management technique, controversial aspects assume their correct place in the perspective. Production executives become organization conscious, instead of class conscious.*"

We have touched only upon some of the high points in Mr. Lewisohn's discussion. It is a thought-provoking treatise, which will prove stimulating to those who are interested in the problem of leadership. It may help to remove some misconceptions, and it will surely be an inspiration to further study of the question.

Economical method of handling engine supplies*

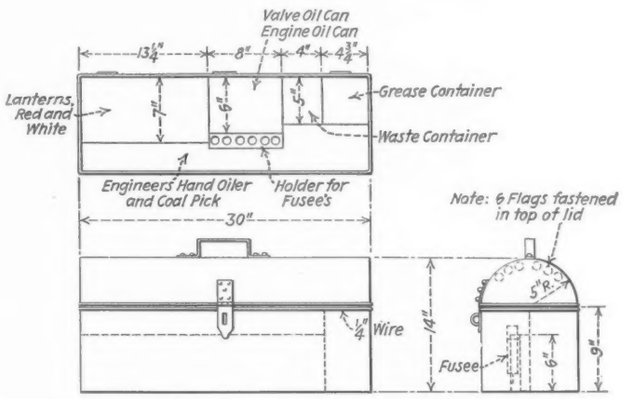
By G. E. Passage,
Division master mechanic, Chicago, Milwaukee & St. Paul, Terre Haute, Ind.

THE conservation of engine supplies has been given considerable thought by various railway officers. In order to reduce the cost of engine supplies, some plan or arrangement must be perfected to handle them economically, as at the present time the various supplies are stored in the different parts of the locomotive. The supplies should be kept together in a definite place.

One way of doing this is to provide and assign a supply box to the engineman as if it were his tool box, which would assist in keeping a closer check on the supplies. We now have a grease box applied on all locomotives and the engineman is in no way held accountable for the amount of grease used. Many times the pin grease is used on hot boxes and cars despite the fact that numerous instructions have been put out that such practice be discontinued.

At different times, we have tried to systematize the checking of engine supplies as the engines come in off the road. This did not prove at all satisfactory, as there invariably was some excuse from the engine crew as to what became of the missing supplies. Especially at large terminals, if checkers were provided and were confined exclusively to checking supplies, enginehouse expense would be increased and yet the desired results would not be obtained. Also, at small terminals, this would not be practical as the expense of assigning a supply checker to this operation exclusively would not be justified. The supplymen at small terminals are assigned to various other jobs. Where men have numerous duties to perform they are bound to overlook certain things and in this way we would not get the proper check on the supplies.

A supply box, shown in the accompanying illustration, is now used on the St. Paul for the purpose of keeping all the locomotive supplies confined to one place. In this box a space is provided for practically every supply that is used on a locomotive. When the locomotive arrives at the terminal the engineman is held responsible for seeing that all supplies are put away and the box locked. When the engine arrives at the oil house or the most convenient place near the supply room, the supplyman removes the box and checks the supplies, fills the lanterns, replenishes the waste and grease supply and locks the box. When the engine is ordered the supplyman places the amount of oil the engine is to receive, in the oil can provided in the supply box and again locks the box and places it on the engine. We are then in a position to check up the engineman and find out what he does with any supplies should there be any missing. A record should also be kept and posted each month showing the amount of supplies drawn by each engineman. In this way we will be able to show an enormous saving.



A compact, portable, galvanized iron locomotive supply box

Lanterns and cans are ordinarily damaged more by the present method of handling them on locomotives than from the use they get. Many daylight trips are made during which the lanterns are not removed from the supply box.

The supply box will encourage an engineman to save a little oil for emergency use if he has a reserve can of his own. At the present time, he does not see the can which he had on the previous trip and naturally doesn't take much interest in the handling of lubricants.

The supply box arrangement should be used only on road locomotives. It would be a hard matter to handle supplies in this way on yard engines because the enginemen in some of our large terminals report for work in the yards. The yard power should be provided with a box that would remain on the engine.

* Abstract of a paper presented before a Supervisor's Club meeting held on the Chicago, Milwaukee & St. Paul.

SOUTHERN.—This company has awarded to Dwight P. Robinson & Co. a contract for the design and construction at Chattanooga, Tenn., of a complete locomotive terminal consisting of reinforced concrete roundhouse, machine shop, boiler, smith and tank shop, wash and locker buildings, storehouse, office and oil house, power house, necessary grading and miscellaneous yard structures.

Making foreman training a reality

Foremen's clubs should have carefully planned programs with definite objectives—Suggestions for topics and recommendations for procedure

By C. Y. Thomas

Supervisor of apprentices, Kansas City Southern, Pittsburg, Kan.

SUCCESSIVE years of intensified development of cars, locomotives and railroad equipment have brought to the fore the era of technical excellence. Our common hackneyed phrase describing the situation is, "The rule of the thumb is no more." Surely, though gradually, have the cruder "cut and dried" methods given way to the application of scientific methods. Frequently those who have an aversion toward studying, as well as those who are hesitant in taking up new ideas and methods, have found it necessary to become engrossed in technical phrases, terms and ideas. Popular approval of the radio has made commonplace such terms as microfarads, ohms and other terms which used to have a mystical significance. Similarly on the railroads, iron was iron and steel was steel, but now it is a charcoal iron, malleable iron, nickel steel, or chrome vanadium steel, all of which are generally understood and their quantities appreciated.

Because of the better application of the public school laws and the remarkable development of the educational system in this country, the railroads are being supplied with better educated employees. It is a fact, however, that most roads pay little attention to the practical education or instruction of these better educated employees. A few railroads have splendid systems for the training of apprentices in the mechanical department, but there the educational program stops.

The group of railway officials, such as master mechanics and shop superintendents, is composed of those who have fought their way up; all possessing some qualities which made them fitted for their positions. In practically every case the individuals have developed themselves without particular help on the part of the railway company. It cannot be denied that these men would be better men had they been given some sort of a systematic training while in lesser supervisory positions. In the higher positions they are constantly receiving a schooling through intimate contact with even higher officials of proven worth, whose suggestions and criticisms are of inestimable educational value; likewise contact between shop foremen and master mechanics is a schooling for the lesser supervisors but not in a way comparable to that above mentioned.

Master mechanics and shop superintendents are charged with a great responsibility in carrying out their work, and ordinarily cannot be intimately acquainted with all the minute details. It is the foreman who sees the little things which count so much in the conservation of materials and time and in the general efficiency. Thus the master mechanic's record varies directly with the ability of his supervisors. With so much responsibility resting upon the shoulders of the shop foremen, it is surprising that so little is done to help them to become better fitted for their positions.

The agencies provided by the railroads for the training of the supervisors are few. A very small group are sent to the various conventions for the purpose of keeping abreast of the times, a few railroads have regular supervisors' associations and a very few roads have what is known as foremen training classes. Much good is accomplished in the latter instances in getting the foremen together and letting them set up a forum of their own. In most cases interesting and instructive talks are made by qualified individuals but the question is, how are the roads to know that each foreman is making the most of the opportunities offered? Three out of four papers or talks will prove educational to about one-half of the listeners.

Many suggestions have been offered as to the subject matter for foremen's meetings, but in most cases there is no continuity of the subjects and no connection between them. Perhaps the greatest fault in the choice of subjects is that problems of immediate concern on the individual railroad are overlooked in favor of something of no particular worth or importance to them.

What real good is to come of foremen meetings when there is no definite or planned study program? The average shop foreman, who happens to be an officer in the club, is a busy individual in the shop and out, and as a result the programs of the meetings are usually mapped out along the lines of least resistance.

We can assume that foremanship training is needed in the railroad shops, but so far no systematized program has been offered. That this is necessary, if the maximum good is to be obtained from the meetings, is readily admitted.

High schools, colleges, correspondence schools and other educational agencies work on definite programs with definite goals of accomplishment. The work in each subject or course is outlined and planned through to the end, each unit of study following in proper sequence and dependent on what has gone before, but sufficient in itself. Then with the work planned, some method is used which will require individual effort. Time honored and proven custom is that of the written examination. To expect an individual to work and study on any project of perhaps no immediate benefit to him when he knows there will be no tests of the information he should have accumulated, makes for a group of disinterested class attendants. If the railroads are willing to leave it up to individual honesty to study, such as is the rule in most foremen clubs, why are not the engine and trainmen accorded the same privilege? Simply because written examinations assure individual effort and give the railroad officials a true line on the knowledge of the persons examined.

Subjects for foremen's meetings

The greatest difficulty in conducting any foremen training class or club, is that of selecting proper subjects for papers or discussions. This is true because of the fact that the average group of foremen will include those who have been promoted in from five to ten entirely different trades. Feed water heater maintenance

naturally does not concern the "rip track" foreman, nor is the coach foreman necessarily interested in arch tubes or flexible staybolts.

As far as his own work is concerned, a foreman who is on the job will be constantly studying all phases and developments and he should not selfishly desire the foremen's class to discuss his own highly specialized problems. No foremen's class should have the objective of making any foreman more expert in his own trade. That should be left to the individual and only those subjects of worth and interest to the entire group should be considered.

A book which would make an excellent text for a foreman's class is L. F. Loree's "Railroad Freight Transportation." A multitude of subjects are covered in this book which will provide subject matter for a class for a considerable length of time. This could be the background for lesson leaflets or outlines on the subject pursued.

Now for some of the subjects regarding which every foreman should have a definite and working knowledge:

A Brief History of the ———— Railroad.
Locomotives—Types, Designs, Utilization, Common Knowledge Points.
Freight Cars—Types, Design, Utilization, etc.
Train Yard Methods.
Freight Train Handling—Tonnage, etc.
Schedule Making for Freight and Passenger Trains.
Roundhouse Handling of Engines.
Repair Track Handling of Cars.
Locomotive Repairs—Classification, Costs, etc.
Freight Car Repairs—Classification, Costs, etc.
The Workings of the Stores Department.
Shop Accounting.
A Primer of Maintenance of Way Work.
Personnel Work.
Character Study—Handling of Men.

Such are a few of the subjects with which every foreman should be familiar and yet, commonplace as they are, they have no meaning in the average foreman's life or work. When a man understands something of the other fellow's work and can appreciate the difficulties in connection with it, there can be some sympathy for him and co-operation between department heads. Smoother operation of the railroad should be a fact rather than a desire, this being an objective of foremen training.

There are a number of things in the average foremen's club of today which subtract from the possible value of the meetings. The first of these is irregular attendance because attendance is usually not compulsory. It is a rarity when 100 per cent of the members attend and generally it is a visit from the superintendent of motive power or higher officer which accounts for it. Almost all foremen are on a monthly salary basis and where there is a hesitancy in attending meetings, it should be made a matter of compulsion. To require attendance at meetings when both the railroad and the individuals are to be helped is certainly not an arbitrary demand.

Another hindrance to good meetings is the custom of many members coming in late. There seems to be a general feeling that since the meeting is held outside of regular working hours, there is no necessity for punctuality. The disturbance caused by members coming late is always disconcerting.

After the papers are read, the discussions are often trivial because the foremen have not made a study of the subject. As a matter of fact, there is little incentive for a member to prepare a discussion, since so few are really interested in the paper. The average member does not enter into the discussions at length because he feels that he is encroaching on the personal liberties of the members by having them stay that much longer. So the meeting closes and although some good has been accomplished by getting the men together, little has really been done in a true educational way.

Suggestions for club procedure

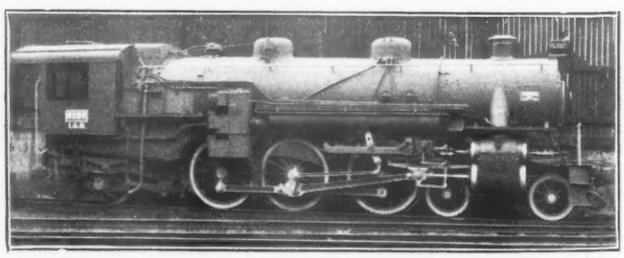
In contrast with the usual type of haphazard meeting, let us visualize a meeting of a real foremen's training class or club. The program for the entire year has been given out, suggesting reference books, etc. A mimeographed outline of the subject for each meeting should be given out a month in advance. The class leader calls the class to order promptly and the discussion is confined to an hour-and-a-half, the outline being prepared for that length of time. Each member has a note book and a loose leaf book for the preservation of pamphlets and notes handed out. Lessons are read or lectures given by picked men, entirely familiar with the subject. Meetings should be held on regular days, once or twice a month—written examinations every three months, followed by posting of grades.

With a carefully chosen list of subjects, everyone prepared on the subject at hand, examinations to show up individual effort, good meetings are assured and a two-fold purpose is accomplished, first—facilitating the study of those interested; second—requiring a certain amount of study on the part of those who ordinarily do not enter into the spirit of the meetings.

Railroad shops as to machines, tools, materials and the like are becoming more systematized every day. Why not do a little towards systematizing the training of foremen? It is a fact that there is a scarcity of good supervising material. Almost without exception a master mechanic or shop superintendent cannot look about him without realizing that one or two of his supervisors should be relieved. Sympathy oftentimes is allowed to enter too greatly into consideration. Thus we find officials temporizing with situations and allowing incompetent supervisors to be moved up because of having no one ready for promotion. This is no doubt due to the fact than no effort is being made to train foremen to be better foremen.

Promotion to the top is slow at best, and particularly so when incompetent supervisors are kept on the job. Such conditions remove the incentive for a man to study and prepare himself for larger opportunities. With these conditions largely prevalent, and likely to continue, systematic foremen training could do much to remedy the evil.

In a class or club as described each railroad could prepare its own training courses, and do so with little extra effort. The possibilities of offering a broader training to the average intelligent group of foremen are too great to be overlooked. Keep them going forward instead of sliding back. There is a golden opportunity in the few hours spent at foremen's meetings and these hours should be intelligently used, making the foremen's club a real training club instead of a sandhouse gossip organization.



American built 4-6-2 locomotive for the Imperial Government Railways of Japan

T. E. A. convention at Chicago holds much promise

Arrangements have been made for a splendid lineup of speakers and reports at annual fall convention

THE Traveling Engineers' Association whose purpose is "to improve the locomotive engine service of American railroads" will meet in annual convention at the Hotel Sherman, Chicago, September 14 to 17, inclusive. Inspired by the initiative of President J. N. Clark (Southern Pacific) and aided by the long experience of Secretary W. O. Thompson, the officers of the association and committee chairmen have co-operated in preparing a program which, in the calibre of speakers obtained and general pertinent character of the subjects and reports presented, will set a new mark for this association, as well as others.

The first subject for consideration, "The Locomotive of Today" will partake more or less of the nature of a symposium at which Samuel O. Dunn, editor of the Railway Age, will preside and R. H. Aishton make the opening address. Among those who will speak on this subject of ever-present interest, as shown in the detailed program of the meeting which follows, are C. H. Markham, W. R. Scott, S. M. Vauclain, A. R. Ayers, W. L. Bean, A. G. Trumbull, and O. S. Jackson. These are names to conjure with in the railroad world and for those who desire to hear the symposium the wise course will be to get to the convention hall early, for standing room will, no doubt, be at a premium.

Other subjects and reports on the program are worthy of special mention, but, owing to space limitations, comments regarding them will be deferred until subsequent issues in the regular convention report.

J. N. Clark (Southern Pacific)
President

J. B. Hurley (Wabash)
1st vice-pres.

J. D. Heyburn (St. L.-S. F.)
2nd vice-pres.

W. O. Thompson (N. Y. C.)
Secretary

Convention program

Speakers:

C. H. Markham, President, Illinois Central System
W. R. Scott, President, Southern Pacific Lines
S. M. Vauclain, President, Baldwin Locomotive Works
A. R. Ayers, assistant general manager, N. Y. C. & St. L. Railroad.
W. L. Bean, mechanical manager, N. Y., N. H. & H.
A. G. Trumbull, chief mechanical engineer, Erie.
O. S. Jackson, supt. M. P. & Mach., Union Pacific.

Subjects:

The Locomotive of Today
Samuel O. Dunn, editor Railway Age, Chairman
J. B. Ennis, vice-pres., American Locomotive Co.
W. E. Woodward, vice-president, Lima Locomotive Works, Inc.
C. T. Ripley, chief mechanical engineer, Santa Fe.

Smooth Train Handling
Frederick Kerby, Baltimore & Ohio, Chairman

Practical Instructions for New Firemen in Combustion and Locomotive Operation
M. A. Daly, Northern Pacific, Chairman

Booster
J. A. Talty, Franklin Railway Supply Co., Chairman

Locomotive Availability in 100 per cent Condition Up-To-Date Roundhouse, Terminal Facilities and Modern Methods.
P. O. Wood, Southern Pacific, Chairman

How Can the Traveling Engineer Cover His Growing Job?
W. L. Hack, St. Louis-San Francisco, Chairman

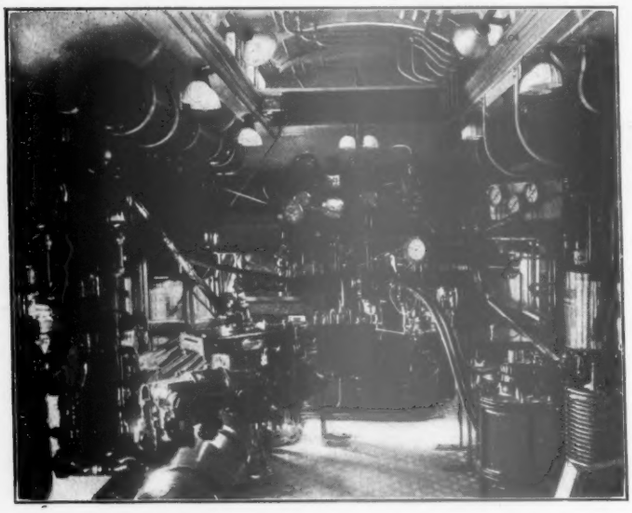
Automatic Train Control
J. M. Nicholson, Atchison, Topeka & Santa Fe, Chairman

Revision of Progressive Examination for Firemen for Promotion and New Men for Employment.
W. H. Corbett, Michigan Central, Chairman.

Missouri Pacific air brake instruction car

THE Missouri Pacific has recently completed and placed in service an air brake instruction car in which the arrangement of the equipment is quite unique. The car includes facilities for instruction in the maintenance and operation for both air brake and steam heat apparatus. The lecture end of the car has a seating capacity for a class of 35. The instruction end of the car is built to represent the boiler head in a locomotive cab. All the equipment in a locomotive cab is included in this arrangement so that the class looking at the arrangement of valves, etc., can easily visualize the relation of each piece of equipment as it is located in the cab of a locomotive. The injector, lubricator, water glass cocks, gage cocks, steam heat valve and sander valves are of sectional construction so that the observer can see the actual construction of each part and how it operates. A No. 6 distributing valve is suspended to one side and in front of the boiler head. This is a tandem valve having a sectional portion connected to the operating valve so that the operation of the piston, valves and various parts can be readily observed. The equipment for the No. 6 E-T, G-6-A, and S-W-A brake is installed so that it can be operated separately by the instructor. The tender brake and the U-C brake-cylinder are set in brackets on the floor so that the class can obtain an unobstructed view of the other equipment.

The braking equipment in the car consists of sets for 22 freight cars and 2 passenger cars in addition to the



The instruction end of the car is built to represent the boiler head in a locomotive cab

engine and tender brake, of standard size. Twenty one standard size freight brake-cylinders and auxiliary reservoirs are secured to the side of the car as shown in the illustration, 10 on one side and 11 on the other. This equipment is complete with retainers and release valves. Each cylinder and auxiliary is equipped with a pressure gage and the piston travel can be adjusted to various lengths from 4 in. to 11 in. A K1 triple valve and reservoir is mounted on a swinging crane which can be swung out in front of the class when desired. The crane locks against the side of the car when not being used for demonstration purposes. The car is also equipped with a six-car passenger train signal equipment, a complete vapor thermostatic heating system and a set of charts which are illuminated by a spot light.

In addition to the instruction room there is a state room in one end of the car equipped with upper and lower berths, wardrobes, lavatory and shower bath. A complete kitchen with range, hot and cold water, lockers, ice box, and also an office equipped with an upper and lower berth, roll top desk, drop table and office files occupy the opposite end of the car.

The instruction room of the car is finished with mahogany to the top of the windows, the deck and ceiling being finished in a light gray. The air brake equipment is painted in standard colors for indicating the different pressures. The office and state room is also finished in mahogany and is equipped with golden oak furniture.

Interior view of the class room

The kitchen, lavatory and bath are finished in whit enamel. The inside length of the car is 62 ft. 10 in. and the total weight is 140,600 lb.

Three classes are held a day, at 9:30 a.m., 2:30 and 7:30 p.m. The superintendent and the master mechanic of each division is informed as to the time the car will be at the different terminals in their territory and they in turn bulletin the classes, requesting that all employees whose duties require them to be familiar with the maintenance and operation of air brake and steam heat equipment visit the car for instruction. Employees attending the classes are required to register and each master mechanic and superintendent is furnished with a list of the employees who visited the car. This list also shows the occupation of those who registered. If any condition arises in which a man shows that he is not as familiar with the maintenance and operation of the equipment as he should be, the attendance list of the car is referred to and if it shows that the man has not visited the car as often as he should, he is instructed to visit the car for further education, and show by his work that he is competent to remain in his present position.

The classes in the car are largely attended and are being handled by district supervisor of air brakes, George Leather and district supervisor of air brakes, L. E. Giffen. These men take turns in handling the car, relieving each other in monthly periods. With this system the car is in the care of a competent instructor at all times who is acquainted with the men and has their co-operation and confidence. By taking turns in handling the car the work does not become as tedious and monotonous as it would if one man were assigned constantly to the car.

Supervisors' clubs on the Wabash

How they are organized and conducted—Some of the more important topics discussed, with observations as to beneficial results

*By J. M. Ganley**

THE Wabash Mechanical Department Supervisors' Club was organized in March, 1923, at Decatur, Ill., the main mechanical department point on the system. A few months later a similar organization was formed at Moberly, Mo., the second largest mechanical department shop and car repair yard. All foremen, lead mechanics, general foremen, supervising officers, chief clerks, road foremen of engines, and fuel supervisors in the mechanical department, and storekeepers and store department foremen and chief clerks are eligible for membership. The purpose of the club is to cultivate and foster good fellowship among the supervisory forces of the Wabash Railway, and to discuss, formulate, and execute plans which will have in view the mutual benefit of both the members and the company.

The officers, consisting of president, vice-president, secretary, treasurer, and a board of five directors, are elected by ballot annually. Regular meetings are held at Decatur on the fourth Saturday of each month, beginning at 8 p. m., in a downtown hall rented by the club.

Some of the topics discussed

At each regular meeting an effort is made to have a paper read on some topic of interest to all the members. One of the first papers presented was on the stripping of engines, by the stripping foreman from the locomotive shop. It brought out many facts that were instructive. As a direct result of this paper and the discussion which followed, instructions were issued by the superintendent of motive power to all engine terminals on the system that work reports covering the major jobs on the locomotives were to precede the locomotive to the shop at least thirty days. This gives the shop people ample opportunity to line up their work and the storekeeper time to order the major items of material that will be necessary. Another beneficial result was the issuance of instructions that, under no circumstances, were locomotives to be "robbed" of parts before being sent to the shop; that is, no parts or appurtenances were to be removed from a locomotive to apply to some other locotive. While it had been customary for years to send in work reports on locomotives coming to the shop, the result of this meeting set a positive date and outlined a definite policy. In the case of robbing locomotives it brought this forcibly to the attention of those concerned that it broke up a practice that, while not being indulged in generally, was being practised at some places.

The material question

A paper on shop efficiency was prepared and read by a car shop machine foreman; it brought out many constructive thoughts and called attention to some poor practices.

At many meetings the material question was brought up and discussed at length. The stores department, naturally, received a lot of criticism. However, these discussions on material certainly had a good effect and resulted in a big improvement in the material situation. As a direct result of these arguments, the division storekeeper prepared and read, at one of the meetings, an interesting and instructive paper entitled "Exchange of Ideas," in which he outlined some of the difficulties of his department and showed where the mechanical department could help him, and in that way help themselves by having an ample supply of material on hand. Just how far the results of the division storekeeper's "Exchange of Ideas" went is practically impossible to determine, but it is safe to say that it directly resulted in a better feeling and a clearer understanding of some of the reasons why material is not always on hand the instant it is needed. A suggestion was made by the storekeeper that a form be prepared and printed, to be filled in by each master mechanic ninety days before the locomotive is due for shopping, this form to show the major items of material that the locomotive will require when shopped, such as tires, wheel centers, frames, cylinders, and a number of other parts. This form and practice were inaugurated and are working now with excellent success. This method allows the storekeeper to order the big items and the shop superintendent to have many of them machined before the locomotive is sent to the shop.

Safety and other matters

The safety inspector, who goes to every shop and station on the railroad, read a paper on safety. This paper, no doubt, has contributed a great deal to the wonderful improvement in the safety work on the Wabash. His subject was a live one and close to the minds of everyone who heard him and its lessons went home.

One of the road foremen of engines adopted as a title for his paper "Mechanical Department Conditions on the Road." He brought to the minds of the shop foremen a good many things that they, as shop men, possibly did not realize.

"Safety and Economy in the Use of Electric Current"—this paper was prepared by the electrical engineer. The facts and figures he offered were astonishing, and his suggestions for economy in the use of current could not help but result in economy and greater efficiency in shop operation; also in doing away with the unnecessary and extravagant waste incident to burning lights and allowing machines to run idle when not needed.

The chief draftsman of the mechanical department chose for his topic "Castings, Blueprints, and Patterns." He gave many facts about castings being too weak or unnecessarily strong in certain places. The information he furnished about blueprints, how they should be filed and cared for, and the expense involved in making them was very pointed. In the discussion that followed it developed that in one shop entirely too much metal was being wasted in borings and turnings, particularly on

* Mr. Ganley is now chief clerk to the assistant general passenger agent, but was employed as secretary to the superintendent of motive power at Decatur, Ill., during the greater part of the development of the supervisors' clubs.

brass castings. This was followed up and many castings changed so that this excessive metal would not be purchased.

The assistant to the traffic manager spoke at one meeting on the traffic situation and offered timely suggestions as to how each employee could help the business of the company. He also stressed the importance of courtesy to the traveling and shipping public.

The scrap dock foreman's paper told of many seemingly criminal cases of good and usable material coming to the scrap dock. At many of the meetings the subject of scrap and reclamation was discussed. A committee was appointed to look after usable material in the scrap pile and to make weekly trips, in a body, as a committee. Those serving on this committee are the general car foreman, assistant general car foreman, freight foreman and blacksmith foreman representing the car department; general foreman, assistant general foreman, gang foreman and blacksmith foreman from the locomotive department (back shop); superintendent scrap and reclamation, scrap dock foreman, locomotive storekeeper, and division storekeeper for the stores department; and the general roundhouse foreman. The immediate results of the work of this committee were astounding in the number of items saved and the members of this committee went back to their respective shops and took drastic measures to stop the waste of good and usable material.

"Correspondence" was the title of a paper prepared and presented by a man from the office of the superintendent of motive power, in which he endeavored to point out the importance of writing in such a way that written thoughts would convey the meaning intended; he called attention to many outworn and high-sounding phrases that have no place in modern business methods. He also pointed out some short cuts in railroad correspondence, and offered a number of suggestions.

Many other interesting and instructive papers dealing with subjects in which the members are interested were read and discussed; for instance, a fuel supervisor's paper called attention to the importance of setting valves on locomotives properly, air leaks in yards, on cars, and around the shop, all of which result in the consumption of more coal; the superintendent of air brakes spoke on air on locomotives, cars, and in yards.

At Moberly the Supervisors' Club is conducted along the same lines as the club at Decatur and many interesting and constructive papers have been read at its meetings, among them being such subjects as the following:

Cleaning and painting engines and cars, by a painter foreman.

Engine tank and freight car trucks, their inspection and maintenance, by a freight car foreman.

Maintenance and operation of locomotive air compressors, by a gang foreman.

The maintenance of locomotives and tenders in compliance with federal requirements, by the general roundhouse foreman.

The supervisor, by a general foreman from a small terminal.

What is required by economically handling machine work at the locomotive shop, by a machine foreman.

Handling of scrap material, by the labor foreman.

†Engine failures, their cause, and how to prevent them, by a road foreman of engines.

Requirements to economically prepare for use freight car, passenger car and engine truck wheels, by a mill machine foreman.

Items of interest to locomotive and car department as noted by a road foreman while in and away from his home terminal.

Slid flat wheels, causes of this damage, proper maintenance and operation, practice to follow to reduce slid flat wheels to a minimum, by a coach foreman.

Suggestions of requirements from the home terminal to assist in obtaining better service and work at outside points, by a general foreman from an outside point.

The daily inspection of locomotives and tenders as required by Rule 104 I. C. C. Boiler Inspection Laws, by a general foreman.

Valve motion, by a roundhouse foreman.

Locomotive stokers, by a road foreman of engines.

The necessity of properly accounting for labor and material used on locomotives and cars and the advantages derived by the foreman in charge, by a general foreman.

Cause and prevention of hot boxes, by a freight foreman.

The preparation of these papers required considerable thought and effort but it is felt the results fully justified the work, as many of the suggestions were put into effect and proved beneficial.

Besides the papers read at the meetings, discussions often arise; for instance, the use of the locomotive crane as a switcher came up at a Decatur meeting and the direct result was that an order was issued by the superintendent of motive power that a locomotive crane must not move more than a certain number of cars at any time, and the cranes were so marked.

At one of the meetings the question came up relative to sending foremen to other shops and other railroads to see what they are doing and to endeavor to pick up information that would be helpful. This practice was put into effect and foremen now go to other shops occasionally; when they return they are asked to tell what they saw and what practices or methods they think could be used to good advantage in their shops.

The subject of an apprenticeship system has been discussed a number of times at the meetings and men have been sent to other railroads having apprenticeship systems to note what they are doing and to make suggestions for a training system. An apprenticeship committee was appointed by the club to look into this matter thoroughly and after considerable investigating it submitted a final report outlining several plans which was submitted for consideration.

Three or four times a year, the regular monthly business meeting is suspended and a social gathering takes its place. These socials usually consist of a dance, card party, and luncheon to which the families and friends of the supervisors are invited. Also, after the regular business meetings it is customary to have lunch or cigars.

The dues of the club are nominal but sufficient to pay for the rental of the hall and the social functions and sometimes even to assist the shop employees association with social functions. etc.

Sometimes, in lieu of papers, motion pictures are shown. These motion pictures are generally operated by representatives of supply companies, who also lecture on the subject. Pictures on the locomotive booster, operation of a certain milling machine, the manufacture of wrought iron pipe, welding, and the method of making acetylene gas and oxygen were shown at Decatur. These were all interesting and brought before the members, in a very vivid manner, things that were new to them.

Attendance at the meetings is not compulsory but an effort is made to have as many members present as possible.

Conclusions

It is difficult to determine just how much good this organization does, but it is safe to say that the exchange of ideas and the suggestions and constructive criticism cannot help but result in the adoption of better methods and the elimination of wasteful and unnecessarily expensive practices. In addition, it brings the supervisors from the various departments together on an equal footing to discuss subjects of interest and "iron out" and settle various controversies or disputes.

† The superintendent of motive power thought so well of the paper on engine failures that copies were made and distributed to various places along the line.

Steel treaters prepare for September convention

Technical program covers wide range of subjects—S. A. E. and A. S. M. E. to participate

PREPARATIONS are about completed for the eighth annual convention and steel exposition of the American Society for Steel Treating to be held in Chicago during the week of September 20. The technical sessions will be held in the ballroom of the Drake Hotel, the headquarters, on the morning and afternoon of each day from September 20 to 24, inclusive.

The exposition will be held on the Chicago Municipal Pier which contains 80,000 sq. ft. of space. Practically 75 per cent of the equipment at the exposition will be shown in operation. The exposition will be open each day from 10 a.m. until 10 p.m. with the exception of Thursday, September 23, when it will close at 6 p.m. because of the annual banquet scheduled for the ballroom of the Drake Hotel that evening.

Metallurgical education

A feature of the convention is a conference on metallurgical education, which is scheduled as a luncheon meeting at the Drake Hotel, 12:15 p.m., Tuesday, September 21. The program will be divided into two parts: The metallurgical educational work by educational institutions and the metallurgical educational work by the chapters of the A.S.S.T. The discussion of the first part will be led by Professor Bradley Stoughton, Lehigh University, Bethlehem, Pa., and the introduction to the second part will be presented by President R. M. Bird of the society.

Session on steel melting

The plan, so successfully started at the Cleveland convention last year, of holding a technical session devoted to the subject of steel melting will be continued this year. The program is under the direction of W. J. Priestley, Electro Metallurgical Sales Corporation, New York. Three papers have already been promised for this session and one or two more are expected.

The Society of Automotive Engineers has arranged to hold its annual production meeting the same week as the convention of the steel treaters. The tentative program calls for technical sessions on September 21, 22 and 23 at the Sherman Hotel, which will be the headquarters. Members will be invited to participate in all the activities of the steel treaters during the week.

The council of the American Society of Mechanical Engineers has authorized the society to participate in the annual A.S.S.T. convention in the form of a day's session on machine shop practice.

Railroad representative appointed

At the meeting of the board of directors of the society during the recent sectional meeting held at Hartford, Conn., it was decided, in pursuance of a suggestion that the railroads be represented on the recommended practice committee of the society. The appointment of J. H. Gibboney, Norfolk & Western, as representing the railroads, was approved by the board and Mr. Gibboney's acceptance was announced.

Many industrial plants will be visited

A fairly comprehensive program has been arranged for plant visitations during the convention. The following general program has bene arranged:

Tuesday, Sept. 21: Trip No. 1. Buda Company and drop forge department of Wyman-Gordon Company, Harvey, Ill.; Trip No. 2. Lewis Institute and Miehle Printing Press & Manufacturing Company; Trip No. 3. American Forge Company and tractor works of the International Harvester Company.

Wednesday, Sept. 22: Trip No. 4. West Pullman works of the International Harvester Company; Trip No. 5. Indiana Harbor plant of the Youngstown Sheet & Tube Company and the plant of the Inland Steel Company; Trip No. 6. Danley Machine Specialties Company, Inc., Chicago; Trip No. 7. Pettibone Mulliken Company, electric furnace production of manganese steel and its heat treatment.

Thursday, Sept. 23: Trip No. 8. Western Electric Company; Trip No. 9. Plant of the Interstate Iron & Steel Company and of the Illinois Steel Company, South Chicago.

Friday, Sept. 24: Trip No. 10. Burnside shops of the Illinois Central and the plant of the Pullman Car Works; Trip No. 11. Columbia Tool Steel Company's and the American Manganese Steel Company's plants at Chicago Heights; Trip No. 12. Die block plant of A. Finkl & Sons and the plant of the Aetna Ball Bearing Company; Trip No. 13. Armour Institute of Technology.

The technical program

While the complete technical program has been decided upon, only a partial list of convention papers has been made public and is as follows:

"Wear resistance of carburized steel versus cast high manganese steel" by W. J. Merten.

"Internal stresses in quenched steel" by S. L. Hoyt.

"Graphitization at constant temperature below the critical point" by H. A. Schwartz and H. H. Johnson.

"The iron-molybdenum system" by W. P. Sykes.

"The nature of oil-hardening non-deforming tool steels" by E. C. Bain and M. A. Grossmann.

"The decomposition of the austenite structure in steels" by R. L. Dowdell and O. E. Harder.

"Some notes on fatigue properties of heat-treated carbon steels" by J. M. Lessells.

"Cyanide brittleness" by V. E. Hillman and E. D. Clark.

"Wear testing of gage steels" by H. J. French.

"Notes on the A_3 stable transformation" by H. A. Schwartz.

"Dendritic crystallization and grain formation in steels" by V. N. Krivobok.

"Corrosion—Fatigue of steel" by D. J. McAdam, Jr.

"Studies on electric welding" by L. J. Weber.

"Mechanical and machining properties of annealed cast iron" by G. C. Priester.

"Use of electricity in heat treatment furnaces" by A. E. White.

"Failures in bolt steels" by V. T. Malcolm.

"On the transformation of retained austenite into martensite by stress" by Kotaro Honda and Keizo Iwase.

"Krupp nitrifying process" by T. H. Nelson.

"Effect of heat treatment on the properties of stainless iron at various temperatures" by P. G. McVetty.

"Aluminum bronze" by Jerome Strauss.

"Standardizing the Brinell hardness test" by H. M. German.

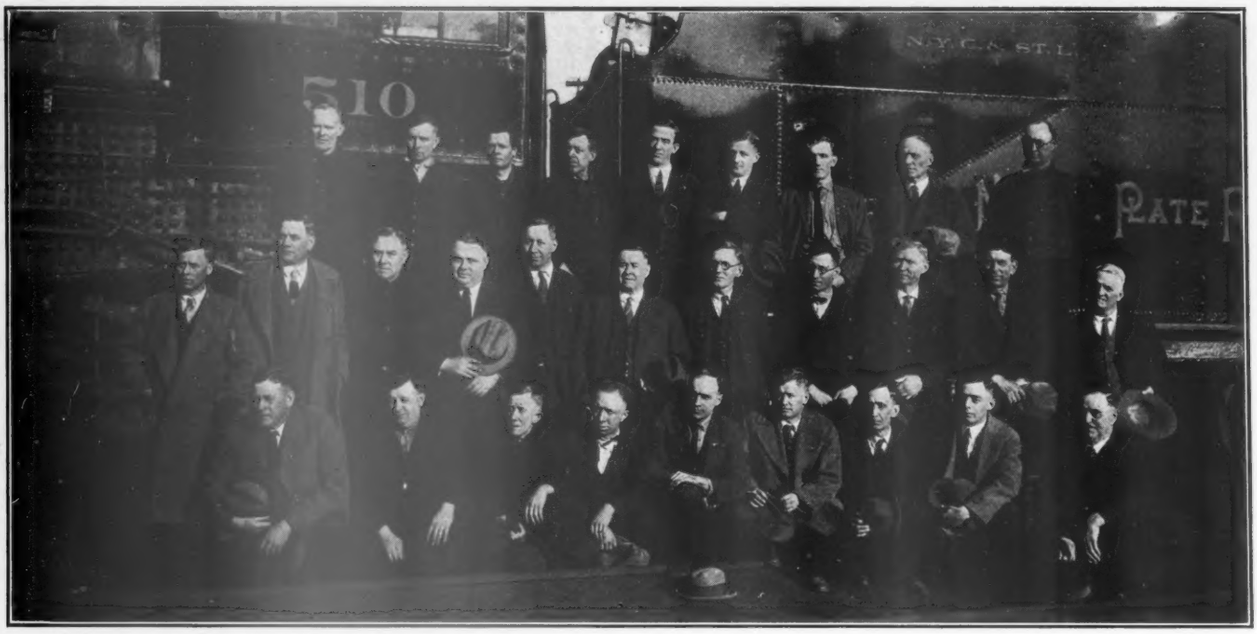
"Correlation of magnetic properties with mechanical hardness in cold-worked metals" by S. R. Williams.

"Hardness testing outfit for steel balls" by S. R. Williams.

"Basic open-hearth practice" by C. H. Herty, Jr.

"Temperature distribution and heat flow in steel during its solidification" by A. L. Field.

"Hair cracks in steel rails" by J. H. Whiteley.



Foremen's club at the Lima, Ohio, shops of the New York, Chicago & St. Louis.

Training for leadership

Several additional suggestions to the survey published in our June number

A COMPREHENSIVE survey of what is being done by the mechanical departments of the railroads in helping to improve the standards of supervision was published in the June number of the *Railway Mechanical Engineer*, page 330. Since the publication of that article a large number of comments and suggestions have been received from railroad officers and others who are interested in this question. Incidentally, a number of requests have been received for more specific information about the formation of foremen's clubs. Those who are interested in this phase of the question will be helped by two articles which appear elsewhere in this issue. One of these, by J. M. Ganley, tells how the supervisors' clubs on the Wabash were organized and are conducted, and outlines some of the more important topics which have been discussed, noting some of the beneficial results which followed specific meetings. The other article, by Supervisor of Apprentices C. Y. Thomas, of the Kansas City Southern, is entitled, "Making Foreman Training a Reality." It makes constructive suggestions as to the programs and procedure of such clubs.

The following article is somewhat in the nature of a symposium of other comments and criticisms of the survey:

New type of leadership

"There is one observation anent your article," said a keen observer of railroad organization, "that I would like to make, to wit: the wonderful improvement in the shop foreman. By improvement I mean an all-around, well-balanced growth, resulting in the accomplishment of more work, with less friction and lost motion. The days of the bulldozing and cursing foreman are gone forever. Today most of the foremen in railroad shops are students of modern shop practices, gentlemen considerate of their men and interested in their welfare. In the old days it was always a mystery to me how a foreman expected to get the most out of his men by constantly waving aloft his authority. The fairness of the modern shop foreman is evident to every one who comes in contact with him."

Inspiration from the chief executive

"It is, however, proper to add," said a vice-president of a large system, "that leadership is inspired from the top. In the case of this system, we are fortunate in having in our president a leader whose example has a beneficial effect on all ranks of employees. He continually advances the policy of good service and, by his appreciation of all that is done to this end, stimulates all with the desire to do well. It is impossible to overstate the value of this, and it should not be overlooked when the problem to which you refer is being considered."

Get-together meetings

"The article in your June number is very complete in itself," writes J. W. Cyr, superintendent motive power, Chicago, Burlington & Quincy, "and the only thing I can think of is that our experience on the Burlington indicates that get-together meetings do more for educational training than any other single source of information."

Studying rules and practices

"Another thing we do over the line," writes George F. Hess, superintendent motive power, Wabash Railway, "which we feel is improving the standing of our

foremen, is to have the assistant master mechanic hold a class at each terminal point. These classes are generally held after the day working force is through work, and we have the day and night foremen attend them, as well as locomotive inspectors and men in the shop generally known as federal inspectors. They go over the I. C. C. boiler and locomotive inspection rules. We do this by asking the men to quote a rule and then have a discussion on it, so that there is no misunderstanding. We have also inaugurated at some terminals, and which we think will be extended, the practice of foremen and inspectors writing one rule a day and giving it to the foreman. If they want to, they may copy the rule from the book, but we feel writing will impress it on their minds better than simply reading it. After we are through with the book of rules, we may go to different instructions that have been issued by the company from time to time, so as to get these men thoroughly familiar with all the rules and instructions in effect."

How to form conclusions

"We believe some of the plans recorded," writes L. K. Sillcox, general superintendent motive power, Chicago, Milwaukee & St. Paul, "will in time become top-heavy, due to the fact that foremen oftentimes consider educational programs burdensome, when the subjects are not directly connected with their particular branch of service. For this reason we have during the current year made a complete change in the subjects of papers prepared for our various staff meetings and also inaugurated a new plan of discussion, which seems to have created added interest in our meetings. For your benefit I quote herewith one of our latest methods of finding a satisfactory conclusion in any special problem.

"We should never enter upon a weighty undertaking without complete mastery of the facts. A successful man is one who is perfectly capable of reaching important conclusions quickly and brilliantly, but such decisions should always be founded on certain knowledge and experience and reflect the operations of a good memory. Whether it be in the course of our daily routine or in our application toward a satisfactory conclusion of a special problem, let us bear in mind and be guided by the following seven points:

"1. Determine what result is desired.

"2. Determine the fundamental which measures the result that is desired.

"3. Divide the problem into (a) human problems, and (b) material problems.

"4. Determine the fundamental of each which should be used as a standard unit to bring about the desired result.

"5. Determine each and every variable, (a) permanent, (b) temporary.

"6. Locate the value of each variable and its relation to the others in the problem.

"7. If a combination of a human and a material problem is to be dealt with, (a) acquire full knowledge of the problem; (b) with this knowledge (or facts) determined for a desired result, see that such facts are put into the proper terms for usual application; (c) it then becomes the problem of the supervisor to develop the procedure to utilize in full the facts located by the study made."

Constructive suggestions

"I spend a great deal of time in handling men, to impress upon them the value of leadership and personality," writes Hugh Montgomery, superintendent motive power and rolling stock, Rutland Railroad. "Leadership is born, and to train a man to see things and do things at the right time and in the right way is a difficult task.

"We have shop meetings once a week to discuss the problems that come up and plan for the next week's work, and I feel that we have obtained wonderful results from these meetings. We also have other meetings on different subjects on different parts of the line, which are attended by all the foremen, and every effort is made to improve leadership; not only leadership, but also the application of the Golden Rule—to use the men under them as they would like to be used themselves.

"I have found in handling men that they look up to the man who does things in the right way. Men will follow a leader where they will lay down under a driver. Having foremen's meetings also will accomplish a great deal to encourage the men in their efforts and put pride in them.

"I try to make all my foremen feel that the railroad is their railroad—the better work they do the better it will be for themselves and the railroad. It is always a pleasure to me to go out and meet them, because they are more like a family. Every one is trying to accomplish the best possible, and, as you say in your article, this cannot be measured in dollars and cents."

Another foremen's club

"We are forming a club at Derby, which, of course, is the central point of the mechanical department on our line," writes W. G. Knight, mechanical superintendent of the Bangor & Aroostook, "and expect to follow the scheme used on the Boston & Maine. It is difficult to get our outside foremen in, especially during the winter time, but we expect to take care of the situation by sending to all foremen who cannot get to headquarters a copy of the proceedings of each meeting."

Talks from officers

"There is not much that we can add to the article, which is instructive," writes T. A. Foque, general mechanical superintendent, Minneapolis, St. Paul & Sault Ste. Marie. "One thing that we have done and which I think that I have not mentioned is that occasionally we have an officer from some other department speak to our foremen. For example, we have had a talk on taxes and accounting, as well as talks by the general storekeeper and traffic officials. These give the foremen an insight into matters foreign to their work, but which are interesting and instructive.

"Another policy that we have followed is to give special attention to shopmen who are likely to be selected to fill positions as supervisors. We make it clear to such men that, while there may be nothing in sight at present, we desire to have them know that they are considered, so that they can study their jobs from the viewpoint of a supervisor. It is not always the best mechanic who makes the best foreman, and we are sometimes disappointed in our selection because of the inability of our appointees to properly handle men. I think it would be interesting to have you prepare another article pertaining to the selection of men."

Visits to other shops

H. L. Worman, superintendent motive power, St. Louis-San Francisco, writes: "Arrangements are made whereby supervisors are permitted to visit special installations at other railroad shops or where new shops are placed in operation, in order to gain information relative to methods or equipment that is more modern than that in use on this road."

Col. George H. Emerson, chief of motive power and equipment of the Baltimore & Ohio, says as to the selec-

tion of men for supervisory positions and their training: "It is the usual practice to select men who have served their apprenticeship in company shops and have taken the apprenticeship course in mechanical drawing. In the case of applicants for such positions, who have not had this training, we propose to give them the opportunity to acquire same, and we are now working on a plan of special training for apprentices and supervising officers through one of the correspondence schools which has such a course available."

Making foremen from piecework inspectors

A superintendent motive power makes the following suggestion: "I have looked over this article very carefully and have no criticism to make, except in my previous letter I did not particularly mention the fact that the introduction of piecework in the locomotive shops makes it necessary to appoint a number of piecework inspectors, taken from their respective crafts. These men are generally selected with the thought in mind that they may some day be advanced to foremen, and it gives the management an excellent opportunity to observe and get acquainted with them before they are advanced; it also gives the inspector an opportunity to show what ability he may possess toward filling an appointment of that kind."

A difficult educational problem

"As to the technical books and publications referred to," writes C. F. Giles, superintendent machinery, Louisville & Nashville, "I am not so sure that this would accomplish the purpose desired. My experience is that very few shopmen, or boys, can be induced to read technical papers or books. They will attend lectures occasionally and some are willing to participate in club meetings after shop hours, especially at the smaller terminal points. It is not an easy matter to attract them to such meetings at terminals located near large cities. They find many other things to divert their attention. Much of the art of railroading, like other businesses, must be absorbed; it can neither be drilled or hammered in. The absorption process obviously is one which calls for time. We aim to encourage all seekers of information by personal contact, as far as it is practicable to do so."

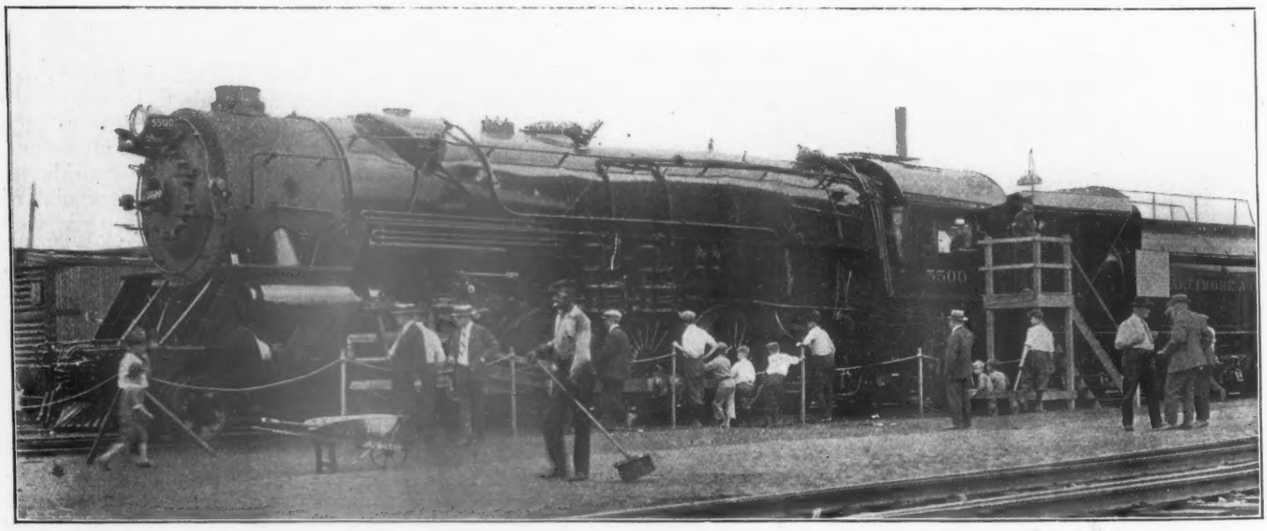
Industrial management course

"There is only one other thing connected with this institution which might have been included in your survey," writes W. R. Young, of the Department of Engineering Extension of the Pennsylvania State College. "In June of each year the industrial engineering faculty of our college co-operates with the Department of Engineering Extension to give an industrial management course. This course is intensive and covers a period of two weeks. It deals with all phases of management from the standpoint of the executive.

"This year the Nickel Plate sent four of its foremen to take up this course. While the industries have been sending men here for years, the railroads never took any interest until this year. These four men who did attend were very outspoken in expressing the benefit derived from the training which they received."

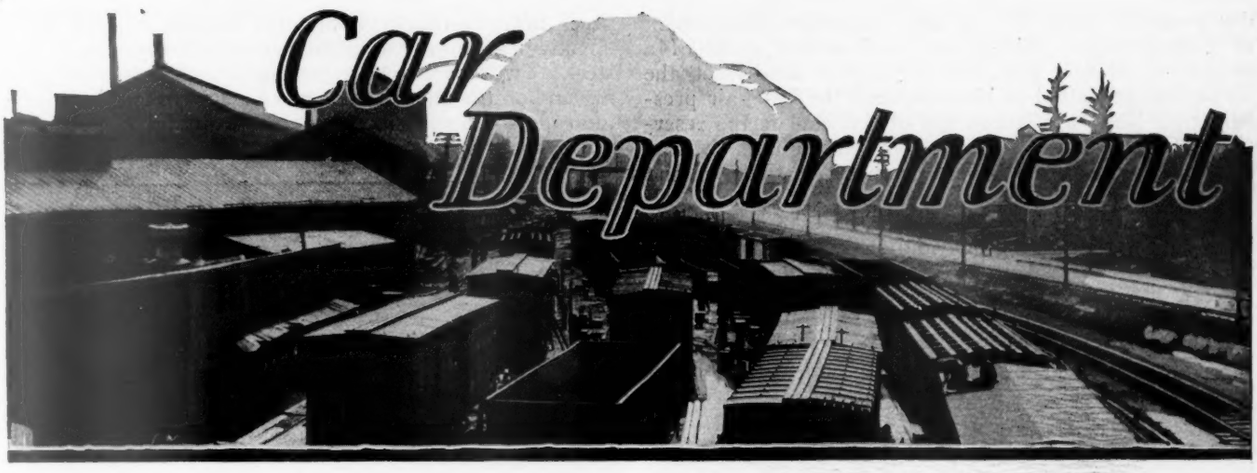
Conclusions

These are a few of the many comments which have been drawn forth by the article in the June number of the *Railway Mechanical Engineer*. One thing which is quite evident from the mass of correspondence which has been received is that many of the mechanical departments are planning on tackling more aggressively this problem of improving supervision and leadership. It is interesting, also, to note as one travels about the country that much really effective work is being done in a perfectly natural way, which is producing splendid results in stimulating the foremen and supervisors to more intelligently develop leadership ability, and yet which is not formally recognized as being specially directed toward this end—at least our attention was not specifically drawn to it when we received reports from some of these railroads. One outstanding piece of work of this sort we hope to have the privilege of drawing attention to in an early issue.



P. & A.

Mountain type locomotive rebuilt from a Santa Fe type by the Baltimore & Ohio, at its Mt. Clare shops, Baltimore, Md., for use in heavy passenger traffic—Total weight of engine, 400,000 lb.; total engine wheel base, 41 ft. 4 in.; diameter of drivers, 74 in.; rated tractive force, 65,000 lb.

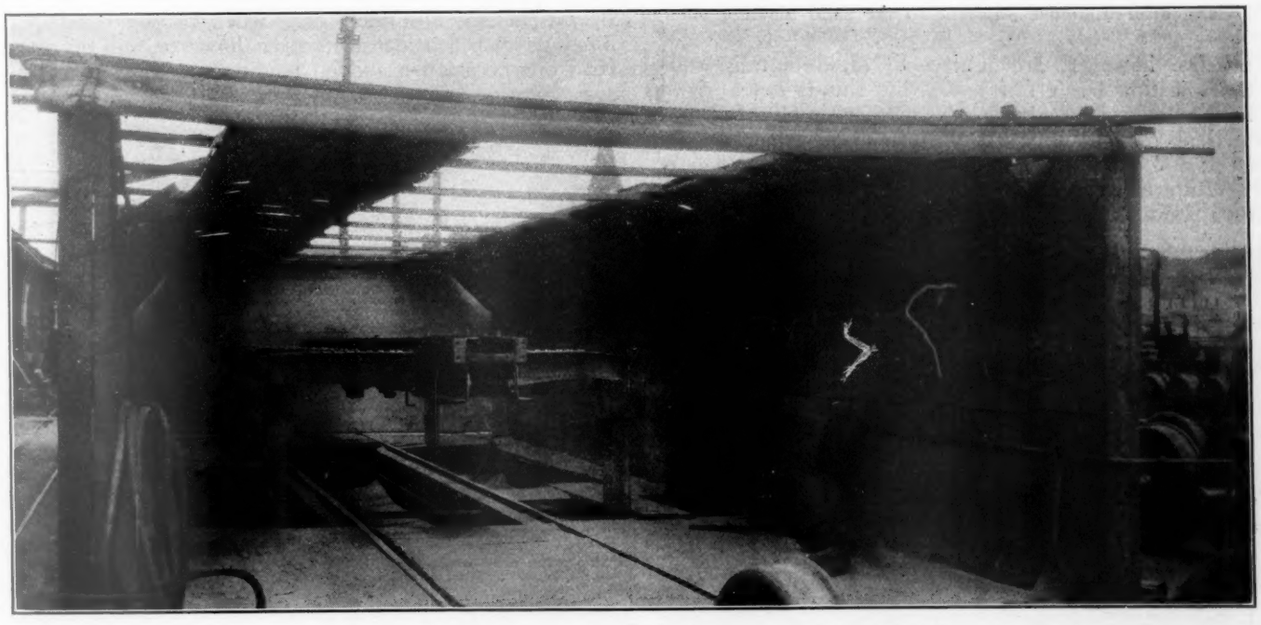


Car shop kinks at Aurora

CAR repair work is handled by the progressive system at the Chicago, Burlington & Quincy shops, Aurora, Ill., a description of this operation having been published beginning on page 284 of the May, 1925, *Railway Mechanical Engineer*. Important factors in the good results secured are the many tools, devices and methods which expedite work at the different stations, thus providing increased production.

Steel needle beams and underframes for new and rebuilt cars are sand blasted before painting, which gives a far better job than could be done by hand cleaning and at considerably less cost in time and labor. These underframes, built of reclaimed parts where possible and new pressed steel shapes, are exposed more or less to the weather after fabrication. As a result it is desirable to clean the entire structure of rust, dirt and scale before painting and this work is done at one of the stations in the regular line up of operations. The finished underframe is moved to a station devoted to sand blasting and immediately thereafter to the next station where a coat of Continental cement is applied with a special spray gun.

The actual work of sand blasting the underframes takes place in an enclosure built to accommodate a 50-ft.

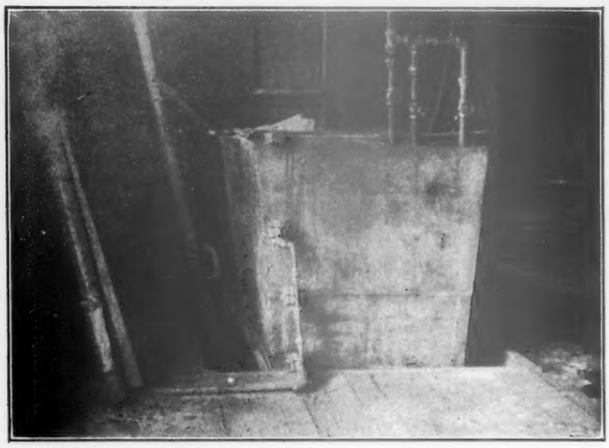


View of the station where underframes are sand blasted

frame. As shown in one of the illustrations, the sides consist of a wooden frame covered with scrap car roofing and extending inward at the top at an angle of 45 deg. to deflect the sand back into the pit. Canvas curtains are provided at the front and back of the enclosure. The top is left open in order to afford good illumination and permit the escape of the fine light dust which would soon make working conditions unbearable in a totally enclosed space.

A simple and effective sanding apparatus has been developed which consists of a tank filled with sand un-

der pressure from the top and a suitable arrangement of piping valves, rubber hose and nozzle made of a section of straight pipe. In starting to sand blast, the air is first permitted to blow through the hose, air pressure then being applied on top of the sand in the reservoir which forces the sand slowly through the bottom into the stream of air which conveys it to the hose and nozzle. In stopping work, the reverse operation is followed, air being shut off from the top of the sand first in order to prevent clogging and stoppage in the piping and connections just ahead of the hose. Experience at Aurora has shown that the heavy 2-in. air hose does not cut or wear with objectionable rapidity. The



Sand drier in house adjacent to the sand blasting shed

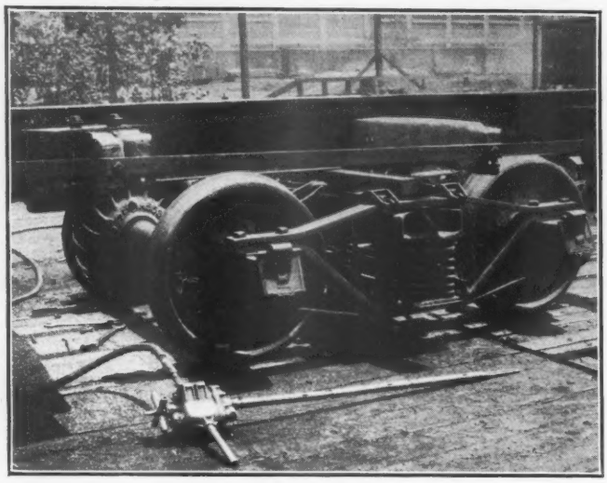
nozzles, however, are subject to rapid cutting, sometimes lasting but a few hours, but this is not a serious item of expense as the nozzles consist simply of straight sections of 1-in. pipe, of the proper length, carried in stock and quickly changed.

White silica sand is used, being unloaded from cars to a storage bin and dryer by vacuum and again by

A two-wheel truck with permanent air motor attachment for drilling or reaming underneath cars

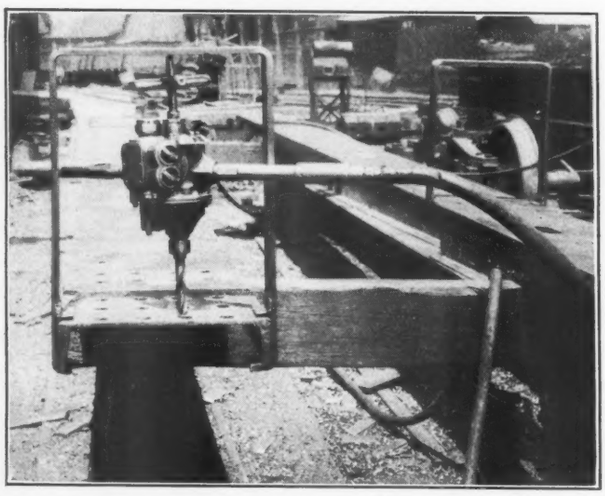
vacuum to the storage reservoir. In case of rain, sand in the pit becomes wet and has to be handled back to the dryer. The durability and good cutting qualities of this sand are indicated by the fact that a single box car of sand proved sufficient for the sanding of more than 400 underframes. The sand is re-used a number of times until eventually it becomes so fine as to prevent effective cutting of the scale and foreign material on the steel. Two operators are generally used for sand blasting and on the underframes now being worked the schedule calls for a movement every 40 minutes.

One of the illustrations shows a device for perform-



This extension reamer greatly facilitates reaming holes in inaccessible parts of the underframe

ing reaming operations on the under side of steel underframes which combines safety and time saving features. Pneumatic motors for either drilling or reaming operations are absolutely safe when properly handled. They develop considerable power, however, and on more than one occasion a sudden binding or stoppage of the



Readily adjustable jig for use in drilling the web of a channel

drill or reamer in the hole causes the air motor handles to be jerked out of the hands of the operator, resulting in his injury. The construction shown in the illustration prevents the possibility of accidents of this kind.

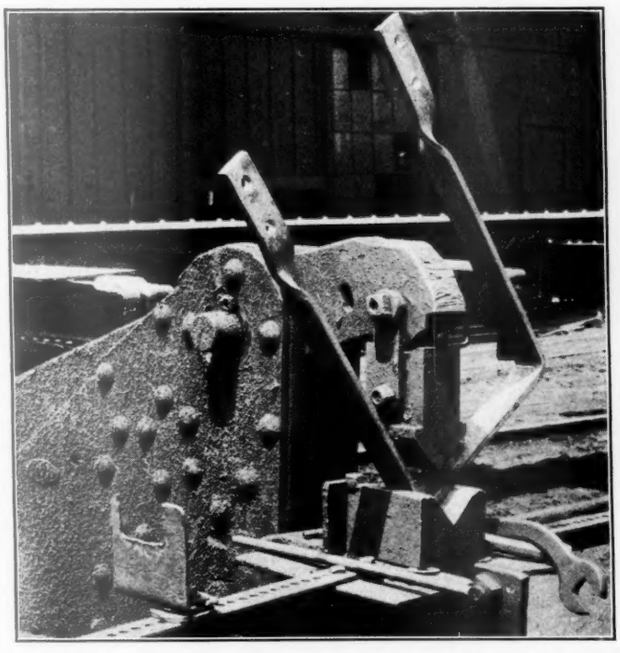
The air motor is supported on the front end of a rebuilt two-wheel truck, being held in place by two J-hooks or U-bolts around the handles which permit the motor to revolve in a plane at right angles to the truck axle. The method of operation is simply to push the truck under the car frame, enter the drill or reamer at the proper point and turn on the air to start the motor. Downward pressure on the truck handles then feeds the motor and reamer upward the required amount to ream

the hole. One man is required at the handles of the truck and another at the motor because experience has shown that this arrangement facilitates more rapid entering of the reamer in the hole, which cannot be readily seen by the man at the truck handles. This device is said to save two-thirds of the labor formerly involved in

This view shows a device which facilitates drilling channel flanges

underneath reaming operations on steel needle beams and underframes.

Considerable thought has been given to the question of drilling operations and the location of equipment for handling this work where it can be done to the best advantage. Where a large number of holes are required in a long new channel, I-beam, or other structural shape, these holes are punched on a power space punching machine, but if a few holes only are required, such as the draft rigging holes in channel ends, these holes are

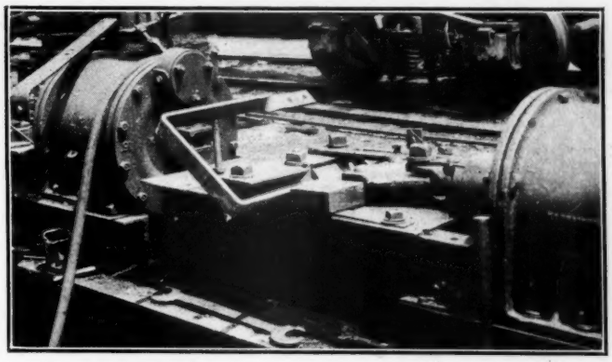


Pneumatic machine arranged for making 90-deg. cold bends in car sill steps

drilled at one of the regular stations with pneumatic motors which saves handling the long, heavy channels to a punching machine and back again. This method saves time and labor.

Two ingenious devices for supporting the air motors when drilling horizontally and vertically are shown in the illustrations. The jig for vertical drilling consists simply of a strap of ½-in. by 3-in. iron bent as shown and provided with shoulders or jaws welded on the lower ends at the proper point so as to fit around the channel. There is sufficient spring in the iron to permit slipping it on over the channel and no adjustment of bolts, nuts, or blocks is necessary. When a hole is required at some other point on the channel it is only a moment's work to move the jig and set up the motor. The jig for horizontal drilling, while differing somewhat in detail, is adjusted with equal ease and rapidity. This construction is shown in the lower illustration in the second column, page 544.

Considerable cold bending work is being done at the



The 90-deg. twist in sill steps is made cold in this machine

Aurora car shops with desirable results in time saving, and two operations required in forming car sill steps are shown in the illustrations. Door brackets, fasteners, stock car fittings and other parts not subject to severe strain can be formed by this method with marked economy, the saving being due to reduced labor cost as well as a saving of time and fuel required for heating operations in a furnace. In forming the sill step illustrated, the first operation consists of making a 90-deg.

View showing a number of completed car sill steps

twist at two points in a straight piece of bar stock of the required cross section. Ninety-degree bends are then made at the proper points in the second machine, the entire operation being performed in a fraction of the time required for heating and hot bending. By the use of suitable dies and machines shown in the accompanying illustrations can be arranged for the cold bending of many other car parts.

Condensed table of A. R. A. rule No. 101 for the car repair accounting bureau

Table A—Couplers and parts

	1	2	3	4	5	6	7
	Gross price		Credits				
	new	s.h.	Scrap body o.p. o.k.	Scrap body and kn'le o.p. o.k.	Scrap body kn. and l. o.p. o.k.	All parts scrap	Scrap body only
5 in. by 7 in. (D)..	24.45	18.34	8.14	4.36	3.09	2.01	1.35
6 in. by 8 in. (D)..	24.75	18.56	8.22	4.44	3.17	2.09	1.43
5 in. by 5 in. ord....	18.85	14.14	7.02	3.84	1.81	1.40	.98
5 in. by 5 in. temp..	20.20	15.15	7.19	4.01	1.98	1.57	1.15
5 in. by 7 in. ord.*..	9.41	9.41	....	....	....	....	1.10
5 in. by 7 in. temp.*	10.35	10.35	....	....	....	....	1.23

*The price shown for 5 in. by 7 in. ordinary and 5 in. by 7 in. temporary standard covers the body only. All parts used in connection with same should be billed in addition at prices shown below.

	1	2	3	4	5
	Gross price			Net price	
	new	s.h.	Credit	new	s.h.
Type (D) Parts:					
Knuckle	5.70	4.28	.50	5.20	3.78
Knuckle lock	1.80	1.35	.08	1.72	1.27
Knuckle pin	.60	.45	.04	.56	.41
Knuckle lock lifter	.35	.26	.01	.34	.25
Knuckle lock thrower	.60	.45	.03	.57	.42
Ordinary Parts:					
Knuckle	4.65	3.49	.31	4.34	3.18
Knuckle lock	2.80	2.10	.07	2.73	2.03
Knuckle pin	.60	.45	.04	.56	.41

Table B—Wheels

	1	2	3	4	5	6
	Gross price			Net price		
	new	s.h.	Credit	new vs. s.h.	new vs. s.c.	s.h. vs. s.c.
Cast iron 7 in. and 8 in.	15.05	8.30	5.25	6.75	9.80	3.05
Cast iron 9 in.	16.25	8.95	5.80	7.30	10.45	3.15
Cast iron 10 in.	17.40	9.55	6.30	7.85	11.10	3.25
Cast iron 11 in.	19.70	10.85	7.30	8.85	12.40	3.55
Cast steel	36.00	18.00	2.00	18.00	34.00	16.00
Wrot steel (one wear)*	21.28	15.19	3.00	6.09	18.28	12.19
Wrot steel	.....	.....	3.00	.....	.....	.....

Service metal—per each $\frac{1}{8}$ in. 1.07.†
Labor turning steel wheels 1.4 hours.

Note—This table is figured on the price of one wheel only.

*No turning allowed on one wear wrot steel wheels. Scrap when defective.

Axles

Capacity	C	D	E	F	H		1 Gross price new	2 Gross price s.h.	3 Credit	4 Net price new vs. s.h.	5 Net price new vs. s.c.	6 Net price s.h. vs. s.c.
1 in. 40,000 lb.	3¼ in.	5⅛ in.	4¼ in.	7 in.	5/16 in.	New	17.72	10.63	2.80	7.09	14.92	7.83
	3¼ in.	4⅞ in.	4⅛ in.	7½ in.	¼ in.	Limit						
8 in. 60,000 lb.	4¼ in.	5¾ in.	4¾ in.	8 in.	5/16 in.	New	21.10	12.66	3.41	8.44	17.69	9.25
	3¾ in.	5½ in.	4⅛ in.	8½ in.	¼ in.	Limit						
9 in. 80,000 lb.	5 in.	6½ in.	5⅜ in.	9 in.	¾ in.	New	27.80	16.68	4.59	11.12	23.21	12.09
	4½ in.	6¼ in.	5¼ in.	9½ in.	¼ in.	Limit						
10 in. 100,000 lb.	5½ in.	7 in.	5⅞ in.	10 in.	¾ in.	New	33.35	20.01	5.56	13.34	27.79	14.45
	5 in.	6¾ in.	5¾ in.	10½ in.	¼ in.	Limit						
11 in. 140,000 lb.	6 in.	7⅝ in.	6⅜ in.	11 in.	⅞ in.	New	40.55	24.33	6.44	16.22	34.11	17.89
	5½ in.	7⅜ in.	6⅛ in.	11½ in.	¼ in.	Limit						
12 in. 200,000 lb.	6½ in.	8⅛ in.	6¾ in.	12 in.	⅞ in.	New						
	6 in.	7⅞ in.	6¾ in.	12½ in.	¼ in.	Limit						

Symbols: C—Diameter of journal. D—Diameter of wheel seat. E—Diameter of center. F—Length of journal. H—Thickness of collar.

Table C—Brake beams and parts

	1	2	3	4	5
	Gross price			Net price	
	new	s.h.	Credit	new	s.h.
No. 1	2.40	2.40	.40	2.00	2.00
No. 2	5.95	4.45	1.80	4.15	2.65
No. 2 plus	6.35	4.75	1.90	4.45	2.85
No. 3	7.35	5.50	2.20	5.15	3.30
Non A.R.A.	2.02	2.02	.35	1.67	1.67
P. S. Bk. rod	2.40	2.40	.12	2.28	2.28
Brake shoes, each	....	....	....	.63	No B.
Brake shoe keys, each.	....	....	....	.08	.08

Table D—Journal bearings

	7 in.	8 in.	9 in.	10 in.	11 in. or over
Gross price	1.60	2.08	3.20	4.00	5.92
Credit	.66	.88	1.32	1.65	2.53
Net price	.94	1.20	1.88	2.35	3.39

Table E—Dust guards

8 in.	.15
9 in.	.17
10 in.	.20
11 in.	.22

Table F—Journal wedges

7 in.	7 lb.
8 in.	9 lb.
9 in.	15 lb.
10 in.	19 lb.
11 in.	25 lb.

Table G

Rivets, first any size each	.48
Rivets, all others ¼ in. each	.07
Rivets, all others ⅜ in. each	.12
Rivets, all others ½ in. each	.12
Rivets, all others ⅝ in. each	.25

Table H

Side door, box or stock car	11.20
Side door, reinforced	18.75
Side door, box, ventilated	13.20
Side door, auto, single over 6 ft.	12.00
Side door, stock with iron rods	12.80
Side door, stock, one half	5.63
Side door, auto, twin or half	12.00
Half door or twin door, auto, reinfor'd	19.00
Half door or twin door, right hand with fixtures for side of refrigerator car.	24.45
Half door or twin door, left hand for side of refrigerator car	17.35
End door, box or stock cars	3.20
End door, vent. wood with iron rods	4.00
End door, half for auto or carriage	12.34
Roof of coke car	2.40
Roof of stock car	2.40
Hatch cover	3.50
Hatch plug	4.00

Table I—Miscellaneous items

	Gross	Credit	Net
Galvanized iron	....	....	.06
Wrot, per pound	.005	.005	.05
Cast, per pound	.04	.005	.035
Mall, per pound	.105	.005	.10
P. s., per pound	.045	.005	.04
P. s. (fabricated)	.05	.005	.045
P. s. (mall. integ.)	.06	.005	.055
Cast steel (100 lb. or less)	.105	.005	.10
Cast steel (over 100 lb.)	.08	.005	.075
Springs	.045	.005	.04
Chain	.08	.005	.075
Chain bk. beam safety	.08	.005	.075
Lumber	....	....	.08
Steel, tank head, (flanged, dished and bev.)	.075	.005	.07
Steel, structural	.04	.005	.035
Labor, per hour	....	....	1.00
Straightening parts off car (per 100 lb.)	....	....	1.70

Box lids, P. S., plain	.20
Box lids, P. S., Int. eye	.43
Box lids, malleable	.90
Card boards, each	.35
Wood screws (per 100)	.36
Turnbuckles, each	.75
Staples, each	.01
Clevises	.22
Clevis links	.15
Clevis bolts	.08
Paint, mineral, per lb.	.10
Paint, lead, per lb.	.17
Nails, per lb.	.035
Lag screws, each	.02
Grip nuts, 1 in. or less	.01
Grip nuts over 1 in.	.03
Unit nuts 1 in. or less	.01
Unit nuts over 1 in.	.03
Cotters, separately	.05
Cotters with other repairs	.01

Table J—Draft gears (See note below)

Name	Type	New	S. H.
Bradford, rocker	24⅝ in. Pocket	51.75	38.81
Bradford, imp. spring	24⅝ in. Pocket	54.65	40.99
Bradford, 0S3 spring	24⅝ in. Pocket	48.90	36.68
Bradford, 0S4 spring	24⅝ in. Pocket	46.00	34.30
Cardwell	15½ in. Pocket	28.20	21.15
Cardwell	18½ in. Pocket	30.75	23.06
Cardwell	24⅝ in. Pocket	33.25	25.01
Gould	FDG-110	33.35	25.01
Gould	FDG-175	33.95	25.46
Gould	FDG-200	33.35	25.01
Gould	FDG-350	36.25	27.19
Hall	H-2	46.00	34.50
Hall	E-14	41.40	31.05
Hall	K-8	34.50	25.88
Hall	K-10	35.65	26.74
Hall	K-10-A	37.95	26.46
Hall	K-12-E	39.10	29.33
Hall	K-18	28.75	21.56
Miner	A-1	34.20	25.65
Miner	A-2-S	32.20	24.15
Miner	A-24-S	37.95	28.46
Miner	A-18-S	45.45	34.09
Miner	A-18-S-2	48.30	36.23
Miner	A-69	37.40	28.05
Miner	A-2-X	32.80	24.60
Miner	A-18-X-2	48.90	36.68
Murray	H Class 25	40.35	30.26
Murray	H Class 25	38.40	28.80
Stanforge	24⅝ in. Pocket	40.25	30.19
Symons	Double vee	46.00	34.50

Cheek castings 11.50 extra per end.
Cheek castings 8.63 extra per end.
Including cheek castings.
Exclusive of springs and rods.
Exclusive of springs and rods.
Exclusive of springs and rods.

Gears—Continued

Name	Type	New	S.H.
National, M-4-A		35.95	26.96
National, M-11		25.90	19.43
National, M-17		34.50	25.88
National, M-18		34.50	25.88
Sessions, K		34.50	25.88
Sessions, K-4		34.50	25.88
Sessions, Jumbo No. 2.		54.65	40.99
Sessions, L		37.40	28.05
Sessions, C		28.75	21.56
Sessions, H		34.50	25.88
Walker, K20A or BP-17		23.00	17.25
Walker, W-1-BP-503		31.65	23.74
Walker, W-3-BP-504		31.65	23.74
Waugh, 18½ in. Pocket		42.85	32.14
Waugh, 24⅝ in. Pocket		47.00	35.25
Waugh, 23⅞ in. Pocket		46.00	34.50
Westinghouse, NY-10		32.80	24.60
Westinghouse, D-4		32.80	24.60
Westinghouse, N-10-F.		46.00	34.50
Westinghouse, N-11		48.90	36.68
Westinghouse, N-11-A.		48.90	36.68

Draft gears (note)

The prices shown for gears are to be charged for various draft gears applied new complete, when necessary to apply on account of any or all parts of the old gear being defective. In conformity with rule 88, one type of gear may be substituted for another if the type substituted conforms to the one removed as to sill spacing and coupler pocket limits and a defect card should be issued for the labor of correcting wrong repairs when such substitution is made. In such substitution complete gears removed shall be credited at 25 per cent of price new, complete, when removed on account of defective friction casing or defective casing and one or more parts other than the casing; and at 50 per cent of the price new, complete, when removed on account of any part other than casing being defective.

Second-hand complete friction draft gears shall be charged at 75 per cent of price new, complete.

When new or second-hand parts of any type of friction draft gear are applied in replacement of such parts being defective, same should be charged at factory prices, as new, plus 15 per cent.

Short method tables for pricing car repair bills

By John J. Whelan
Assistant chief, car repair accounting bureau, B. & O. Baltimore, Md.

THE car repair accounting department of a railroad receives and sends out many thousands of repair bills. Each bill must be carefully checked as to material and labor charges. Of course, this information is contained in the A. R. A. Code of Rules governing the interchange of traffic. Although the billing clerks memorize many of the most commonly used charges, nevertheless there are many which must be looked up in the book.

Rules 101 and 111 are the two most frequently referred to. In an effort to expedite this work, two tables have been compiled which show, at a glance, the material and labor charges covered in these rules. These tables have been placed under the desk glass with the result that the billing clerks refer to them to obtain the net charge, thus eliminating the necessity of referring to the rule book. Furthermore, the accuracy of the bills has been improved by having the compiled figures before each clerk, thus eliminating the necessity of working out net charges in detail each time a specific charge appears for calculation.

The tables are marked A, B, C, etc. Table A covers couplers and parts and the charges and credits based on the type of coupler applied and removed. Columns 1 and 2 represent the gross new and second-hand prices for the different types of couplers from which the amounts in either Columns 3, 4, 5, 6 or 7 are deducted according to the condition of the coupler removed. The result is the correct net charge.

Example:—A new 5-in. by 7-in. Type D coupler is applied. Referring to Column 1, the charge is $24.45. A 5-in. by 7-in. Type D coupler is removed and all parts are scrapped. Column 6 shows a deduction of $2.01 for the parts which leaves a net charge of $22.44. Columns 4 and 5 of coupler parts show the net price after allowing scrap credit.

Table B refers to wheels and axles and the charges and credits based on the size and condition of the wheels applied and removed. Columns 1 and 2 show the new and second-hand prices of each wheel, while Columns 4, 5 and 6 show the net charge for each wheel, according to the condition when removed.

Example:—Two new 8-in. cast steel wheels are applied and one second-hand and one scrap wheel removed. The net charge is $16.55, which is the combined total of Columns 4 and 5. Columns 4, 5 and 6 under axles, show the net charge to be made according to the size and condition of the axles applied and removed.

Table C refers to brake beams and the charges and credits based on the size of the beam applied and removed. Columns 1 and 2 represent the gross price of new and second-hand beams, while Columns 4 and 5 represent the net charge where the same size beam is removed and applied. Where a different size beam is

Short method table for air brake prices given in A. R. A. rule No. 111

Allow credit at $0.005 per pound for the following parts: Triple ..... 19 lb. Reservoir ..... 98 lb. Cylinder ..... 60 lb. All other items, no credit due.	1 Cylinder and triple C. O. T. & S.	2 Cylinder, (detachable)	3 Cylinder (combined)	4 Cylinder and reservoir, R. & R.	5 Reservoir, R. & R.	6 Cylinder release spring	7 Cylinder gasket	8 Triple valve gasket	9 Cylinder pressure head	10 Cylinder non-pressure head
8 in. material	...	Body 6.72	5.47	....	Det. 9.32	.85	.04	.08	1.27	1.35
	...	Comp. 12.32	11.07	....	Comp 9.32					
10 in. material	...	Body 7.84	6.60	....	Det. 10.74	.85	.05	.08	1.27	2.12
	...	Comp. 16.80	15.55	....	Comp. 11.00					
Push rod	.10	.10	.10	.10	....	.10	.10	...	...	...
Clamping piston	.06	.06	.06	....	....	.06	.06	...	...	...
Cylinder head R. & R.	.12	.12	.12	.12	....	.12	...	...	...	...
Disc. reservoir block	...	....	....	....	....	...	.12	...	...	...
Disc. cylinder	...	....	.21	....	....	...	...	...	...	...
Reclamping	...	.06	.06	....	....	.06	...	...	...	...
Removing cylinder	...	.36	.36	.36	....	...	...	...	...	...
Removing reservoir	...	....	....	.12	.12	...	...	...	...	...
Removing release rods	...	....	....	.12	.12	...	.12	...	...	...
Removing release valve	...	....	....	.06	.06	...	...	...	...	...
Removing two plugs	...	....	....	.06	.06	...	...	...	...	...
Removing triple	.12	....	....	.12	.12	...	...	.12	...	...
Disc. triple union	.10	.10	....	.10	.10	...	.10	.10	...	...
Disc. retainer union	.10	.10	....	.10	.10	...	.10	.10	...	...
Cylinder C. O. T. & S.	1.30	....	....	....	....	...	...	...	...	...
Disc. cylinder and res.	...	....	....	....	.21	...	.21	...	...	...
Removing pack. leather	...	....	....	....	....	...	...	...	...	...
Removing check valve case	.06	....	....	....	....	...	...	...	...	...
Emerg. valve seats	.15	....	....	....	....	...	...	...	...	...
Cylinder cap	.09	....	....	....	....	...	...	...	...	...
Triple C. O. T. & S.	1.94	....	....	....	....	...	...	...	...	...
Total	4.14	.90	.91	1.26	.89	.34	.81	.32	.50	...

Pipe per foot	Gross	Credit	Net
⅜ in.	.05	.0025	.0475
1 in.	.10	.005	.095
1¼ in.	.13	.01	.12

	Net
Triple valve body, comp. o. s.	9.10 (W.A.B.)
Triple valve body, comp. o. s.	8.00 (N.Y.)
Triple valve K-1 or K-2 (body)	12.60
Triple valve convertible, comp.	23.13
Triple valve K-1 or K-2 comp.	31.40
Triple valve conversion price	11.30
Air hose gasket	.05
Union gasket (any size)	.05
Triple union nut	.17
Triple union swivel	.17
Release rod	.08

	8 in.	10 in.
Reservoir stud and nut	.09	.09
Pipe strainer	.95	.95
Pipe strainer, union nut	.19	.19
Pipe strainer, union swivel	.19	.19
Dirt collector, 1 in.	1.88	1.88
Dirt collector, 1¼ in.	2.36	2.36
Dirt collector, deflector and plug	.47	.47
Cylinder piston rod	2.12	2.54
Cylinder piston follower	.15	.45
Cylinder piston packing leather	.45	.65
Cylinder piston packing leather, WABCO or JM	.73	.95
Cylinder piston packing leather expander	.08	.10
Cylinder piston packing leather expander, JM. type	.50	.60
Cylinder pressure head with lever bkt. lug	2.20	2.63
Cylinder pressure head detach bkt. only	.28	.28
Cylinder pressure head bkt. and two nuts	.17	.17
Cylinder gaskets	.04	.05

Retainers	Gross	Credit	Net
2 Pos. sing. weight	.70	.42	.28
3 Pos. doub. weight	2.57	2.25	.32
2 Pos. sing. spring	.98	.83	.15
3 Pos. doub. spring	4.67	3.18	1.49
Release valve	1.20	.65	.55
Cut out cock 8 in. or 10 in.	2.22	1.35	.87
Air hose	2.40	.65	1.75
Angle cock, plain	2.35	1.30	1.05
Angle cock, self lock	2.85	1.50	1.35

Pipe	⅜ in.	1 in.	1¼ in.
Bushings	.02	.03	.04
Couplings	.04	.08	.13
Elbows	.04	.11	.13
Nipples 12 in. or less	.05	.08	.13
Reducing ells	.05	.13	.20
Unions, lip type	.09	.14	.20
Unions, ground joint	.13	.26	.40
Union tee	.19	.27	.36
Threads cut, each	.15	.15	.15
Connections, each	.10	.10	.10

Second-hand complete friction draft gears shall be charged at 75 per cent of the new price. When new or second-hand parts of any type of friction draft gear are applied in replacement of such parts being defective, same should be charged at factory prices, as new, plus 15 per cent.

applied and removed, the charge in Column 3 is deducted, to obtain the net charge.

Example—A new No. 2 plus truss beam is applied on account of the removal of a defective No. 1 beam. From $6.35 shown in Column 1, deduct $.40 shown in Column 3, which gives a net charge of $5.95.

Tables, D, E, F, G, H, I and J do not need any explanation as they are a reproduction of the rules to avoid the necessity of referring to the book.

The air brake table is of importance as it covers the overlapping labor features in connection with the other parts applied when a cylinder and triple valve are cleaned, oiled, tested and stencilled. For instance, Column 1 shows in detail the labor charge for cleaning, oiling, testing and stencilling a cylinder and triple valve, while Column 5 shows the detailed labor for removing the reservoir. There are three items of labor overlap in both columns which reduce the reservoir price to $.57, plus $4.14 in Column 1, or a net charge for both items of $4.71. This table saves considerable time in referring to the rules as it would be necessary to locate the three items in the above example.

Copper steel.—A 16-page booklet summarizing the scientific conclusions of various authorities on the value of alloying steel with copper to resist corrosion, has been issued by the American Sheet & Tin Plate Company, Frick building, Pittsburgh, Pa.

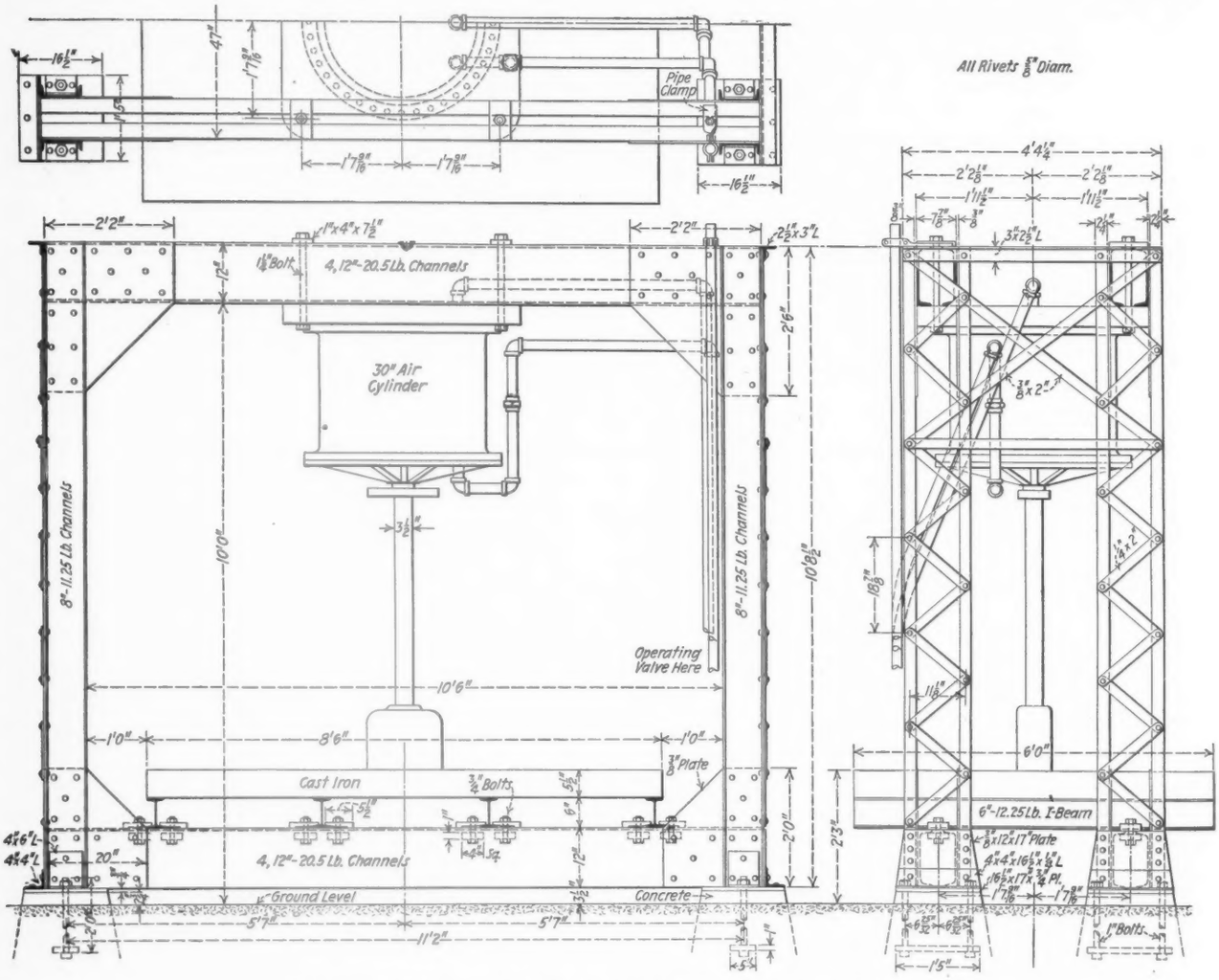
Press for straightening sheets for steel cars

By E. A. Miller

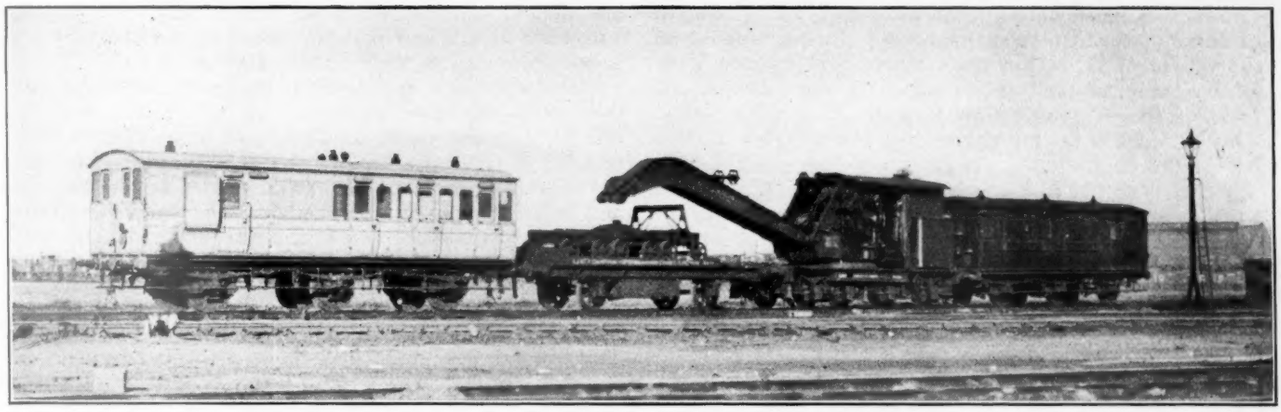
SHOWN in the drawing is an air-operated press which was specially designed for straightening bent plates removed from steel cars going through the repair shop. This press is a standard design on one railroad and can be used for straightening car channels, angle bars or rods if desired. It is of substantial construction throughout and is suitable for heavy work.

The press rests on four concrete piers. On the top of each pier is a ¾-in. plate, 16½ in. by 17 in., on which rests two 12-in., 20.5-lb. cross channels, as shown in the drawing. A 30-in. air cylinder is supported by a frame made of eight 8-in., 11.25-lb. channels composing the vertical members, and four 12-in., 20.5-lb. channels from which the air cylinder is supported. The two 11.5-lb. channels are placed back to back and braced together, as shown in the drawing, by ¼-in. by 2-in. flat bars to form the corner post.

The ram or former block is of cast iron, 7 in. by 15 in., by 12 in., and is secured to the lower end of the piston rod. It is raised and lowered by movement of the piston in the air cylinder which is controlled by a valve.



Drawing of air operated press for straightening sheets of steel cars



Consist of wrecking train stationed at a medium-sized terminal

Wrecking equipment used on English railways

Area in which wreck trains work and organization of crews closely parallels American practice

By L. P. Parker

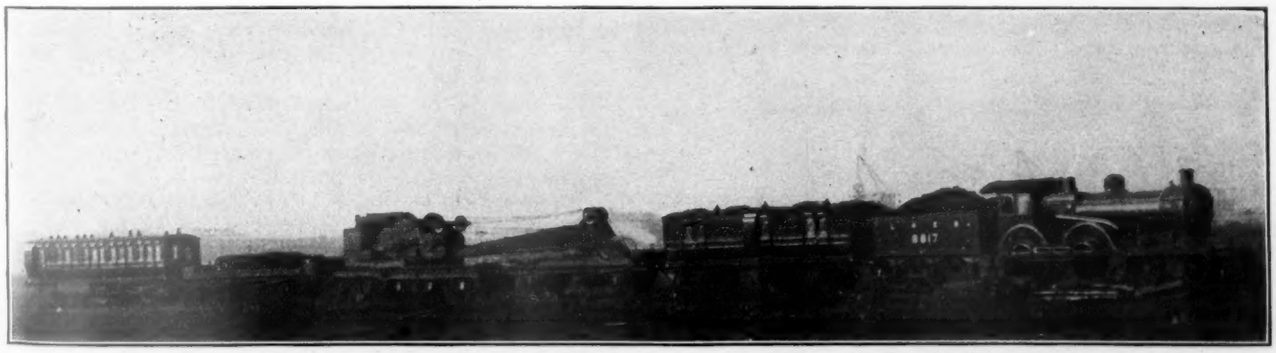
London district locomotive superintendent, London & North Eastern, England

THE organization for clearing wrecks on the English railways is in general based upon the local supervision of locomotive power, each district locomotive officer being held responsible for clearing the line after an accident within the area over which he exercises control. The farthest point of this area is rarely more than 50 miles from the district headquarters.

A wrecking train is stationed at the headquarters of each locomotive district, and at a few other selected terminals. At the most important points this train includes a steam wrecking derrick of about 40 tons capacity, while other depots have smaller derricks of 15 to 25 tons maximum lift. At a few country running sheds the hand crane still survives. In addition, there are some sheds which, although of comparatively minor importance, are either at some little distance from a district headquarters, or are liable to be called upon fairly frequently for assistance, due to small mishaps in adjacent shifting and classification yards. At these a tool car, with jack, ramps, etc., is stationed. A tool car of this type is also kept at a few of the largest terminals for use when the wreck train proper is otherwise engaged.

A call for assistance, in the event of a mishap, is transmitted to the headquarters of the nearest wrecking crew, and on the information contained in the message the officer in charge decides whether he can deal with the wreck with his own equipment or whether he will require assistance. This, if needed, is requested direct from the nearest point where it is available.

The largest wrecking derricks at present in use have a maximum lifting capacity of just over 40 tons at a 20-ft. radius, at which the available lift is 38 ft. Two cranes, such as this, will deal expeditiously with almost any derailment, and it is very rarely that more than one is needed. Within the last year or two, however, newly designed types of locomotive are again showing an increase in weight, although, under the English restrictions of rail-gage, height, width and axle-loads, our largest



Large wrecking crane and its supporting equipment stationed at the Stratford terminal, London

locomotives reach only a small proportion of the weight of some of the American monsters. In this connection the weight of H. N. Gresley's Pacific type express locomotive, now adopted as standard for the heaviest express passenger work on the L. & N. E., is informative. This is 332,200 lb. for engine and tender, and 206,000 lb. for the engine only. It represents the present high water mark of size in English locomotives; and, no doubt, since these heavier locomotives are becoming more numerous, it will shortly become necessary to consider the provision of wrecking derricks up to some 55 tons capacity, more especially as such a crane would be able to lift, by itself, the heaviest of the sleeping cars which are being used on the long-distance trains. At the same time it must be remembered that probably 90 per cent of all

Wrecking crane with a capacity of 23 tons

the locomotives in use in England weigh less than 80 tons each, when upcoupled from their tenders, and that a 40-ton crane will rerail these expeditiously by lifting at the two ends alternately.

Description of the derrick and auxiliary cars

One of the wrecking cranes illustrated is stationed at the Stratford (London) terminal of the London and North Eastern, a terminal to which are allocated about 450 locomotives. It may be taken as typical of the larger English wrecking cranes, and weighs 83 tons with the jib lowered and resting on the guard truck. The jib is 30 ft. long; the lift under various conditions and at varying radii is given in the following table:

Radius of jib ft.	To lift and slew with crane blocked up, tons (English)	To lift, travel and slew with counterweight in position, tons (English)	To lift, travel and slew without counterweight, tons (English)
35	16	3	2
33	19	..	..
32	..	5	..
30	24	..	5
28	27	7½	6
26	30	9	..
23	35	11	9
20	35	13	11
18	35	..	12
17	35	15	..
15	35	16½	14

This crane carries an extra 3-ton counterbalancing weight for the jib on the guard truck. This is attached under the boiler when the heavier lifts are required, but it is not used in the ordinary way. When the weight to be lifted exceeds 19 tons, the crane is secured to the rails by dog clips at each corner, and is further supported by four blocking girders, normally housed underneath the crane. These are extended, when required, by a rack and pinion, worked by a hand ratchet, and are then secured on hard wood packing by means of the jacking screws provided at their outer ends.

An electric light is carried at the point of the jib and another at the base. A useful feature of this crane is the eternal index plate, shown in one of the illustrations, which gives a direct reading of the normal lift at different heights of the jib. This is duplicated inside the cab, and is therefore at all times under the immediate attention both of the crane driver and also of the man directing operations on the ground.

The steam crane is always included, when at home, as part of the wreck train. This includes the crane, its guard car or cars, and either one large car or two smaller ones, giving accommodations for tools, wood packing, a riding compartment for the crew, and a private compartment for the officer in charge, who is accompanied, on important jobs, by the officers responsible for traffic arrangements and for the permanent way.

The two-car arrangement is preferred in most quarters, as both may be fitted as brake vans. One is placed at each end of the train, which is then immediately reversible without shunting—a considerable advantage under certain conditions.

The number of vehicles on the train thus varies from one, where the tool car is the only equipment, to five, made up by the crane, two guard trucks, and two cars. Exceptionally, an extra car is included, and reserved for wood packing.

The distances from the home stations at which breakdown trains do their work are short, and sleeping accommodation for the crew is not required. They are usually comfortably housed in their riding compartment, which

This wrecking crane has a capacity of 39 tons

is furnished with cushioned lockers, a table, cooking stove, hot water urns, washing accommodation, and provision for drying wet clothes.

The question of food is not difficult, and it is not the practice to carry any considerable supplies on the train. There are few places where, if an accident occurs, fresh supplies cannot either be obtained close by, or sent from the nearest town or village. Coffee and biscuits are provided—and appreciated—for use on short jobs, and an emergency supply of canned meat is carried, but very seldom used. When a big wreck occurs at a distance from any town or village, a supply of fresh food is taken on board the train, if at all possible, before it leaves its home station, to cover any delay in obtaining local supplies.

Internal arrangement of the tool car

The internal arrangement of the tool cars is held to be a matter of primary importance. It is endeavored to arrange the tools so that each one is in sight and immediately accessible. To this end, boxes and lockers in the tool cars are not favored, the smaller equipment being carried in racks, clips, and trays, so that it can be seen at a glance whether anything is missing. A strip of iron plate is often laid down the middle of the car so that the heavier tools, such as jacks and ramps, can be slid, instead of carried, to the doorway, where a swing jib is fitted to lower such equipment to the ground.

Chains and slings, of which a good assortment is urgently necessary, are carried on one of the guard trucks. Wood packing, mainly in lengths of about 3 ft. by 10

Lift indicator which gives a direct reading of the normal lift at different heights of the jib. Its replica is located in the cab in front of the crane operator

in. wide and 2 in. to 4 in. thick, is made of one of the harder and tougher woods, such as elm, and is carried in considerably quantity.

The main lighting equipment consists of acetylene flares in sizes of 500 to 1,000 candle-power. "Water lights" are also occasionally used. When the job is likely to be completed in a short time the ordinary oil flares are often preferred, as they require less preparation, and can be immediately lighted and extinguished.

A complete ambulance equipment, with stretcher, splints, bandages and dressings is carried in the larger cars; where space is more limited the stretcher is sometimes omitted. Portable fire extinguishers are also usually provided.

Equipment carried in the tool cars

The equipment of tools depends to some extent on the size of the wrecking derrick, and the more ingenious devices are often met in the smaller cars, where those in charge have to rely more upon their own resources than upon the use of a big steam crane. Some appliances, however, are fairly general, including single and double ramps—rarely used if a crane is available—hydraulic jacks in capacity up to 24 or 30 tons, snatch blocks with wire cables for pulling a derailed engine by means of another on an adjacent track, forcing screws, rail stops, and so on. A compact pattern of American ball bearing mechanical jack has recently been tried and found very useful in certain circumstances.

The following list gives the chains, tools, etc., which have been found convenient at one of the larger locomotive terminals:

	Length
1—2-ton circular sling	6 ft.
1—2-ton fourfold sling	5 ft.
1—2-ton single sling	38 ft.
1—2-ton single sling	6 ft.
1—2-ton double sling	7 ft. 6 in.
9—3-ton drag chains	20 ft. to 25 ft.
1—3-ton circular sling	5 ft.
2—3-ton double slings	21 ft.
1—3-ton double sling	26 ft.
3—3-ton single slings	20 ft. to 25 ft.
1 set—4½-ton carriage slings and shackles	21 ft.
8—5-ton double slings	13 ft. to 16 ft.
1—5-ton double sling	24 ft.
3—5-ton single slings	35 ft.
3—6-ton towing chains	23 ft. to 40 ft.
4—6-ton single slings	22 ft. to 27 ft.
2—8-ton single slings	12 ft.
4—10-ton towing chains	23 ft. to 28 ft.
2—10-ton double slings	11 ft.
4—12-ton single slings	22 ft.
1 set—15-ton boiler slings	6 ft.
4—18-ton locomotive slings	18 ft.

2—10-ton lifting hooks.
1—20-ton lifting hook and links.
4—15-ton shackles.
1—18-ton shackle.

1—24-ton hydraulic jack
6—20-ton hydraulic jack
2—15-ton hydraulic jack
3—12-ton hydraulic jack
} Non-traversing, with interchangeable handles.

2—25-ton ratchet jacks.
1—small screw jack.
1—pair double ramps.
1—pair single ramps.
2—clips for withdrawing intermediate drawbar pins.
3—rail clips for locating engine wheels when rerailing with jacks.
1—rail clip for jack when pushing vehicles sideways.
6—adjustable screw hangers for attaching truck to car body when lifting to rerail.
1—ladder.
2—pickaxes.
1—spade.
6—shovels.
2—axes.
2—crosscut saws.
1—hand saw.
1—hack saw with 6 blades.
6—files and handles.
5—long chisel bars.
1—dozen flat chisels.
4—round nose chisels.
2—cross cut chisels.
3—long pin punches.
6—short pin punches.
9—cold sets.
9—rod punches.
3—short cotter drifts.
3—long cotter drifts.
4—hand hammers.
8—flogging hammers.
1—lead hammer.
4—screw drivers.
5—long pinch bars.
10—short tommy bars.
6—steel wedges.
1—samson for straightening car axle guards.
6—oil bottles, various sizes.
7—oil feeders.
1—syringe.
40—spanner wrenches, various sizes.
1—spreader bar with set of shackles.
6—C-links, various sizes, for attaching chains together.
4—fire extinguishers.
1—oxy-acetylene cutting plant complete.
4—acetylene flare lights.
4—acetylene hand lamps.
4—large oil torch lamps.
4—small oil torch lamps.
3—tail lamps.
2—tender draw bars.
2—locomotive draw bars.
2—intermediate drawbars and pins.
12—couplings, various types.
16—iron packing pieces for securing a broken locomotive axle.
8—car runners, for replacing broken axle boxes.
4—plates and studs for securing broken truck springs.
3—trolleys for temporary replacement of damaged car or pony trucks.
16—steel shackles, various sizes.
1—steel straight edge.
3—wheel gages.
1—rail gage with spirit level.
2—flags (red and green).
1—66-ft. tape measure.
1—2-ft. rule.
6—binding ropes, various lengths.
150—pieces elm packing, various lengths and thicknesses.
100—wood wedges.
2—coffee urns.
1—copper can.
1—dozen enamel cups.
1—dozen enamel plates.
1—dozen large knives.
1—dozen forks.
1—dozen teaspoons.
14 lb.—canned meat.
Coffee, biscuits, sugar.
Ambulance cupboard with dressings and set of bandages.
1—set of splints.
1—stretcher.
1—bowl and sponge.
1—pair of scissors.

The foregoing equipment, as will be seen, is that of a wreck train where reliance is placed for rerailing mainly upon the use of a large wrecking derrick. At a smaller terminal the equipment of chains and slings is much less complete, but the means for rerailing by dragging, ramping, and jacking, is more extensive. In such cases considerable use is made of traversing hydraulic jacks in sizes up to 35 tons, and of other appliances, such as Pearson car-replacing jacks, slewing tackle, and so on.

The organization of the wrecking crew

The exact size and composition of a wrecking crew depends on the importance of the terminal and to some extent on the personal predilections of the officer in charge. A complete crew usually contains 12 men, all of whom are called only for serious accidents. The generally accepted number for a crew for ordinary work is eight, excluding the foreman, who is almost invariably a skilled locomotive repairman; these eight men usually include a car repairman, a locomotive repairman, and occasionally a blacksmith, the remainder of the crew

being composed entirely of picked and trained laborers.

The wrecking crew is not wholly employed on that work, which is nowhere sufficiently continuous to keep it fully occupied at all times. At the smaller terminals, the men are essentially a part of the repair shop organizations, who are called away from their ordinary work when required for breakdowns occurring during their tour of duty, and sent for by means of bicycle messengers, when needed at other times. They are required to live within a very short distance from the terminal.

At the larger terminals there are two main schemes of organization. Under one scheme, the crew is divided up among the shifts which come on duty at intervals during the 24 hours, so that when a call is received bells can be rung simultaneously in all parts of the terminal, and the wreck train manned within a very few minutes. This is the best way, so far as extreme promptitude is concerned, but has the disadvantage that either a large total number of trained men must be available, or the crew must be completed with odd men from the running shed.

Under the other scheme, the men are placed on duty at a regular time each day, and have definite places in the repair shop organization; but they are primarily regarded as members of the wreck crew, and attend all calls whenever they occur. By this method the same individuals attend all accidents, and have more opportunity to become highly skilled at their work. The train does not get away quite so quickly, but is expected to leave its terminal within 30 minutes from the receipt of the call. An improvement is frequently made on this period during ordinary working hours, and it is not very often exceeded at other times.

At the main terminal under the charge of the writer, the members of the wreck crew live close by in houses

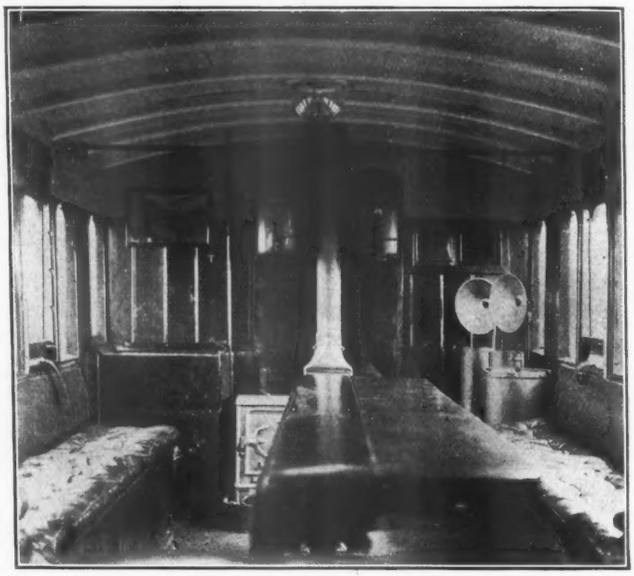
Two English wrecking cranes in action

owned by the railway company. These houses are connected to the enginehouse telegraph office by an electric bell, so that, if they are not already on duty, a call can be transmitted to the men almost simultaneously with the receipt of the message. This crew consists entirely of selected and trained laborers, and, by constant practice, gives results at least as good as those obtained by crews including skilled mechanics.

There are very few places where a foreman is engaged and occupied mainly as a wrecking foreman. Where this is the case, he is invariably a skilled locomotive repairman, and may fill in his time by the supervision of coaling arrangements and yard laborers at the main terminal. More usually, the head foreman in charge of locomotive repairs acts also as foreman of the wrecking crew. Another arrangement, less popular than the last mentioned, is for the foreman of the locomotive repairmen to attend to locomotive derailments and serious accidents, and for the foreman of the car repairers to deal with car derailments. The locomotive officer in charge of the district or his principal assistant invariably attend all calls excepting those for mishaps in shifting yards.

How the wrecking crew is paid

The payment to the crew of the accident train is regulated by the various national agreements and awards which govern the conditions of employment of English railwaymen. Under these agreements the manual workers on the railways are divided into two main classes. On the one hand are those engaged in the engineering trades—skilled mechanics, their helpers and laborers.



Riding compartment for the wrecking crew

The rate of payment to any of these men included in a wreck train crew is governed by Award (No. 728) of the Industrial Court, which, after laying down the standard rates for all the engineering staff in every railway center, states that:

1—All ordinary time worked between 6 a.m. and 6 p.m. is paid at the standard rate.

2—Rate and a quarter is paid for the first two hours overtime between 6 a.m. and 6 p.m.

3—Rate and a half is paid for all further overtime worked between 6 a.m. and 6 p.m.

4—Rate and a third is paid for all ordinary time between 6 p.m. and 6 a.m.

5—Rate and a half is paid for all overtime worked between 6 p.m. and 6 a.m.

6—Double rate is paid for all time worked between midnight Saturday and midnight Sunday.

7—The appropriate day or night overtime rate is paid to men called on duty during the eight hours rest following their ordinary working hours.

The rate of payment to men of the conciliation grades included in a wrecking crew is governed by a series of national agreements made between the companies and the trade unions and the arrangements for payment of these men are perhaps slightly simpler than in the case of the mechanical staff:

1—All ordinary time worked between 4 a.m. and 10 p.m. is paid at the standard rate.

2—Rate and a quarter is paid for all overtime between 4 a.m.

and 10 p.m., and also for all ordinary time worked between 10 p.m. and 4 a.m.

3—Rate and a half is paid for all overtime worked between 10 p.m. and 4 a.m., and also for all time worked between midnight Saturday and midnight Sunday.

4—The appropriate day or night overtime rate is paid to men called on duty for four hours or less.

5—Emergency duty exceeding four hours is treated as one of the six regular weekly turns, and is paid accordingly, if the man is thereby unfitted to take up his succeeding ordinary turn of duty.

The minimum payment made to a man of any grade when called specially on duty is that for two hours at his ordinary rate; and in addition to this, or to the payment to which he is entitled under the arrangements above cited, a special allowance is made for each call, equal, at present, to one third of the standard daily wage for a laborer.

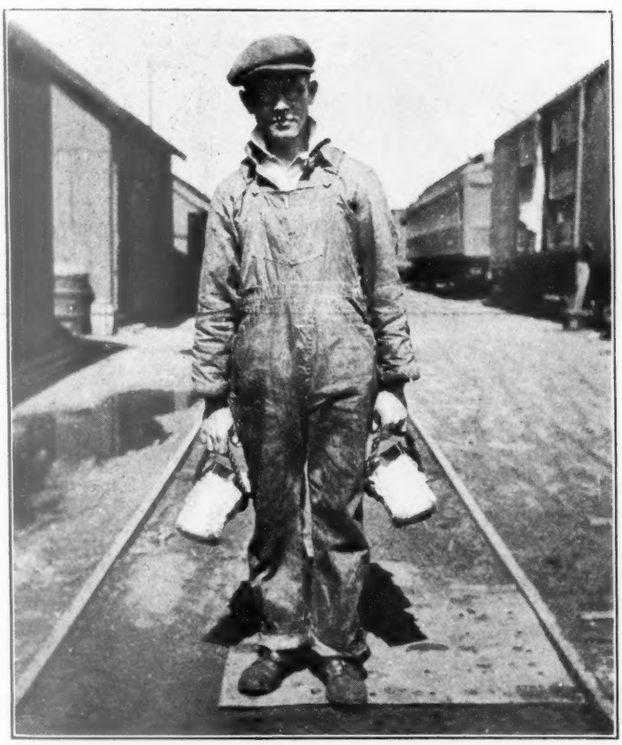
It will be seen that where calls for wrecking duties are frequent, the work is well paid, in comparison with that of an ordinary laborer; and that is as it should be, for the team work of a well trained and competent crew is a pleasure to see, and their value to the responsible officer is beyond rubies.

Hand loops for carrying heavy metal

By Joseph C. Coyle

IN railroad work, as well as any other industry, little kinks, that make the work easier for the men, save money for the company as well.

The 5-in. by 9-in. journal brasses weigh about 22 lb. each, and the small size and the shape, make them rather



An easy way of carrying journal brasses

hard to carry. At the same time, if only one or two brasses are required for the job in hand, a workman does not care to bother with a wheelbarrow.

At the Denver shops of the Denver & Rio Grande Western the handling of brasses is made easy by the use of spliced rope loops, which enable the workman to carry two of the brasses with little effort. Any other heavy piece of metal may be carried with these loops providing the surface is uneven enough to prevent slipping.

Decisions of the Arbitration Committee

(*The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.*)

Temporary repairs made to cast steel bolsters

On May 15, 1923, the Indiana Harbor Belt Line rendered a bill of $390.67 to the St. Louis-San Francisco for repairing a broken cast steel truck bolster on St. L.-S. F. car No. 77466. In making repairs the handling line applied four patches and secured them with 32 rivets for which it made no charge as they were temporary repairs. The handling line stated that the bolster was also bent, which necessitated a blacksmith labor charge of $11.05 for straightening. It also charged 5.2 hours labor for R. & R. the bolster, 1 hr. for raising the car, 48 cents for grip nuts and 119 lb. of box and column bolts. The handling line later refunded $5.72 which covered the labor charge for R. & R. the bolster, but it refused to cancel the other charges. The handling line made the temporary repairs in accordance with A. R. A. Rule 17 and based its charges for labor for straightening the bent bolster on the interpretation of Item 421-A of Rule 107. The car owner contended that the handling line should have either welded the bolster according to Rule 23 or applied a new one to justify any charges whatever.

In rendering its decision the Arbitration Committee stated that, "The Indiana Harbor Belt Line should cancel all charges in this case as the repairs were of a temporary nature. The objection of the St. Louis-San Francisco is sustained."—*Case No. 1363, Indiana Harbor Belt vs. St. Louis-San Francisco.*

Responsibility for car damage when the brake chain fails

On July 20, 1924, while C. Y. C. X. tank car No. 951 was being switched in the yards of the Missouri-Kansas-Texas, the brake chain broke, allowing the tank car to get away and strike M.-K.-T. flat car, No. 113079, knocking the coupler down and breaking the end sills of the flat car, bending the coupler and breaking the end sills, two running boards and the striking plate of the tank car, and causing the tank to leak so that it was necessary to transfer the load to another car. The Conley Tank Car Company stated that the damage to the car was M.-K.-T. responsibility according to Rule 3 on page 3 of Supplement No. 1, A. R. A. Code of Rules, effective July 1, 1924, contending that the M.-K.-T. was negligent in the inspection of the car and that the accident was caused by a worn link in a chain caused by a bent brake rod bracket which permitted the chain to drag on a wheel. The M.-K.-T. stated that the car was given the usual inspection and that the car, when being switched over the hump, was protected by a car rider and that when an attempt was made to control the car,

the brake chain broke which prohibited the rider from controlling the car, thus resulting in the car being damaged which under these conditions is the owner's responsibility.

The Arbitration Committee based its findings on Decision 1323, which reads as follows: "The evidence shows that the handling line provided rider protection and that every reasonable effort was made to protect the car, therefore, the car owner is responsible."—*Case No.* 1364, *Conley Tank Car Company vs. Missouri-Kansas-Texas.*

Responsibility for air hose torn off in switching service

On April 10, 1924, the Chicago Junction Railway put a new 1⅜-in. air hose on the "B" end of Texas & Pacific car No. 32099 for which it billed the car owner for $1.75. The handling line stated that the air hose was torn off because it would not automatically uncouple at the time the car was switched, thus being an owner's defect, as outlined in Rule 58. The car owner contended that the air hose was torn off because the cars were pulled apart without uncoupling the hose by hand, which practice it considered unfair usage, making the replacement handling line responsibility.

In rendering its decisions the Arbitration Committee stated that, "Inasmuch as the air brake hose was not missing complete, the car owner is responsible under Rule 43. The bill is, therefore, sustained."—*Case No.* 1362, *Texas & Pacific vs. Chicago Junction.*

Cars damaged by trucks pulling out

The Illinois Central reported on November 12, 1923, to the car owner, the destruction of Texas & Pacific box car No. 7021. This car was of 60,000 lb. capacity, and was of good construction, equipped with Cardwell friction draft gear and Universal cast steel draft arms. The Illinois Central later advised, on December 31, 1923, that this car had not been destroyed, but had been given necessary repairs in its shops for which it rendered a bill for the amount of $180.31. The Texas and Pacific sent a representative to the Illinois Central shops to investigate the damage to the car, as a result of which the car owner refused to accept he bill for repairs, claiming handling line responsibility because of the trucks being pulled out and allowing the car body to drop to the rails. Furthermore, the car owner did not agree with the Illinois Central that the physical condition of the car was responsible for its being damaged because the rules allow the receiving line to reject any car whether empty or loaded that in its opinion is unsafe for handling. If this car had been unsafe, the handling line could have refused it in interchange. Furthermore, the original record of the handling line showed that the car was decayed, which, the owner maintained was proved to be in error by the handling line's wreck report, believed to be the only source from which the handling line could have obtained a report of the actual physical condition of the car to substantiate its claim.

On June 28, 1923, the Illinois Central billed the Texas & Pacific for $163.20 for repairs to T. & P. box car No. 8362 which was of the same construction as the car above mentioned. Here again the T. & P. refused to accept the bill for repairs, under the claim of unfair usage resulting from the trucks being pulled out and allowing the car body to drop to the rails. In this case the car owner claimed that if the car had had rotten sills and defects as claimed by the handling line, it would be reasonable to assume that the I. C. would have made the necessary repairs while the car was on its repair track, under Rule 120, which allows the handling line to expend $225 labor without consulting the car owner, instead of waiting until the trucks pulled out. In both cases the handling line defended its position by stating that the two cars failed on account of their age and poor physical condition, and not because of unfair usage.

In rendering its decision the Arbitration Committee stated that "the handling line is responsible in both cases. Decisions 1186, 1236 and 1342 apply."—*Case No.* 1366, *Texas & Pacific vs. Illinois Central.*

Floor renewed on defect card to replace sills

On December 26, 1922, Pere Marquette car No. 12911 was derailed while on the Detroit & Toledo Shore Line property. As a result of the derailment, the handling line issued a defect card for the following damages: one center sill, one intermediate sill, one side sill and one sub sill broken. "A" end; one intermediate sill broken, "B" end. After the car was repaired, the car owner billed the handling line for the renewal of the floor in the car. The handling line took exceptions to the billing for the flooring, claiming that the defect card did not authorize it. The Pere Marquette stated that the defect card correctly omitted flooring as the damage to it was not directly due to the derailment, but was an indirect result of the derailment, it being necessary to damage all the flooring to remove the four full length longitudinal sills.

In rendering its decision, the Arbitration Committee stated that, "The statement of the Pere Marquette as to the necessity for renewing the entire floor on this car is in conflict with common practice in making repair of this character. The ordinary construction of wooden underframe gondolas is such as to permit the pulling down of longitudinal sills from the floor to renew them with a small amount of damage to the floor. The objection of the Detroit & Toledo Shore Line is sustained."—*Case No.* 1360, *Pere Marquette vs. Detroit & Toledo Shore Line.*

Time limit for presenting joint evidence

On May 15, 1922, the Louisville & Nashville made the following repairs to C. & W. C. box car No. 1650:

Repairs made	Why made
1 Door hasp strap	Broken
3 Door hasp strap bolts, R. & R.	Necessary
W.A.B.F-36 triple valve R. & R. & Cyl. c.o.t.s. per Rule 60	FL-3-16-21 Out of date

On July 10, 1923, the C. & W. C. secured joint evidence showing that the car was equipped with Westinghouse H-1 triple valve, that Westinghouse K-1 triple valve was standard and that the car was stenciled on both sides to show that Westinghouse K-1 triple was standard, the joint evidence further showing that the Westinghouse H-1 triple was applied by the L. & N. on May 15, 1922. Joint evidence, together with billing repair card, was furnished the L. & N. The latter declined to furnish a defect card for the wrong triple valve because the car was first received home December 1, 1922, and the joint evidence was not secured within 90 days as required by Rule 12. The C. & W. C. contended that a defect card should have been furnished in accordance with Rule 87, for if the L. & N. had complied with this rule when the wrong repairs were made, attaching a defect card at that time to the wrong triple valve, it could not have raised the technical point of time limit.

The following decision was rendered by the Arbitration Committee: The contention of the Louisville & Nashville is sustained. Decisions 1270, 1285 and 1351 apply.—*Case No.* 1361, *Charleston & Western Carolina vs. Louisville & Nashville.*

Interchange car inspectors and car foremen to meet

Opening session at Chicago to be addressed by R. H. Aishton—25th annual meeting

THE members of the Chief Interchange Car Inspectors' & Car Foremen's Association will hold their 25th annual convention at the Hotel Sherman, Chicago, September 21 to 23, inclusive. While there is not much change in the general character of subjects considered by this association, which include freight claim prevention, car shop practices, interchange rules, loading rules and billing, these subjects are all of such vital importance and have such a direct effect on the net earnings of the railroads that they may well be repeated. Each year's discussion brings added experience in the science of handling material and men, which is one of the most important factors in the work of car inspectors and car foremen.

Following the opening address by R. H. Aishton, president of the American Railway Association, the subject of freight claim prevention will be discussed by a representative of the A.R.A., followed by a paper on wheel shop practice, which practice lends itself to an organization on a productive basis, perhaps better than that of any other department of railroad mechanical maintenance work.

Col. B. W. Dunn, chief inspector of the Bureau of Explosives, will address the association, and the subjects of interchange difficulties at small points, simultaneous preparation of billing repair cards and record of repairs, and progressive rebuilding of house cars, will be presented by individual speakers.

The Chief Interchange Car Inspectors' & Car Foremen's Association has increased in convention attendance particularly in the last few years, and this year should be no exception. It is hoped that few members will miss attending and thereby forego the opportunity to increase in knowledge of methods which promote more efficient handling of railroad car equipment. Following is the convention program.

J. P. Elliot (Terminal Railroad Association)
President

B. F. Jamison (Southern)
First vice-president

E. R. Campbell (Great Northern)
3rd Vice-president

A. S. Sternberg (Belt Rwy. of Chicago)
Secretary

September 21

Meeting called to order at 10:00 a. m. Daylight saving time.
Address By: R. H. Aishton.
Address By: President W. P. Elliot .
Report of secretary and treasurer.
Report of entertainment committee.
Report of membership committee.
Address: "Freight claim prevention" by Mr. Joe Marshal, special representative, American Railway Association.
Individual Paper: Subject "Handling wheels and axles at wheel shops" by W. T. Westall, assistant district master car builder, N. Y. C.

Afternoon Session at 2:00 p. m.

Address: By Colonel B. W. Dunn, chief inspector bureau of explosives.
Individual Paper: Round table discussions. Subject "The trouble of the small interchange points and the remedy," by John Rauscher, C. I. I., Cincinnati, Ohio.
Individual Paper: "Method of preparing A. R. A. billing repair cards and record of repairs simultaneously at the car," by C. C. Hennessy, head A. R. A. clerk, C. C. C. & St. L.
Individual Paper: "Progressive rebuilding of house cars," by C. M. Hitch, district master car builder, B. & O.
Remarks: By visitors.

September 22; morning session at 9:00 a. m.

Discussion of A. R. A. rules of interchange.
Remarks: By visitors.

Afternoon Session at 2:00 p. m.

Continued discussion of A. R. A. rules of interchange.

September 23; morning session at 9:00 a. m.

Discussion on the subject: "Cars condemned for transfer at large terminals and methods used to get cars through by repairing without the necessity of transferring."
Remarks: By visitors.
Report: "Question Box Committee."
Remarks: By visitors.

Afternoon Session at 2:00 p. m.

Election of officers.
Remarks by members and visitors.
Adjournment.

Main rod reclamation at Silvis shops

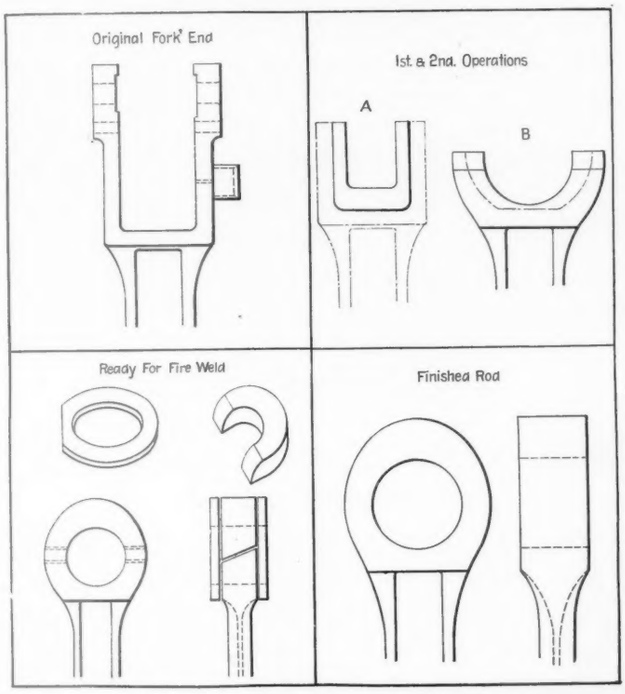
Fork and strap end rods converted to solid back end type by simple and effective method

FAVORABLE results with the floating bushing, solid back end type of main rod induced the Chicago, Rock Island & Pacific about a year ago to consider the conversion of fork and strap end main rods to the solid back end type, particularly in cases where bolt holes were worn to the limit and the rods would otherwise be scrapped. After some experiments, a method was developed at the system shops, Silvis, Ill., which proved both simple and effective and produced essentially new solid back end main rods at a fraction of the cost of forging new rods from billets. As shown in the tables the cost of converting one fork end type rod, including labor, material and a generous pro rata for shop overhead expense was but $32.91; for the strap end type, $66.69; the difference in cost being accounted for largely by additional forging in the case of strap end rods.

Since August, 1925, this conversion work has been carried out in the case of 57 fork end rods and 128 strap end rods. A real tribute to the practicability and effectiveness of the new method is afforded by the fact that these rods have been in service, in some cases for 12 months, without failure or trouble of any kind. A program is now being worked out whereby heavy passenger

Fork end main rod before and after preparation for welding to form solid end type

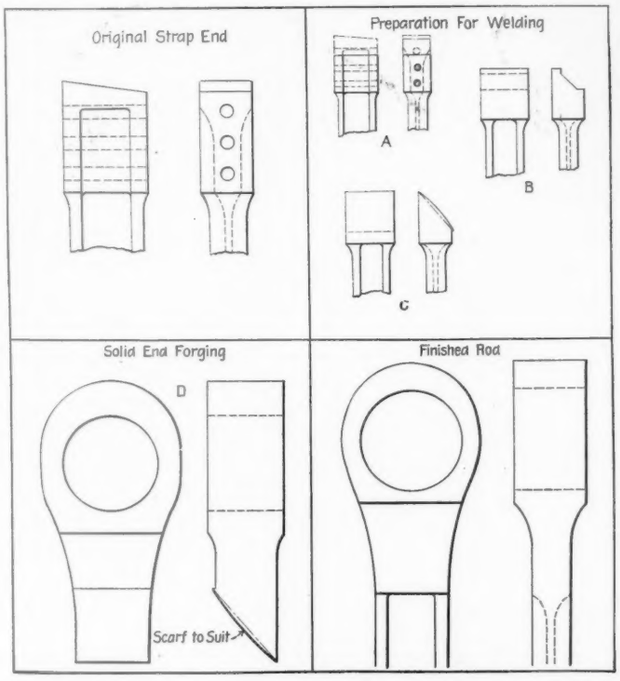
and freight power on the Rock Island will be equipped with solid back end main rods as locomotives pass through the shops for general repairs.



Detail operations in converting fork to solid end main rods

Converting the fork end type

The method used in converting the fork end type of main rod is shown in one of the drawings, the first

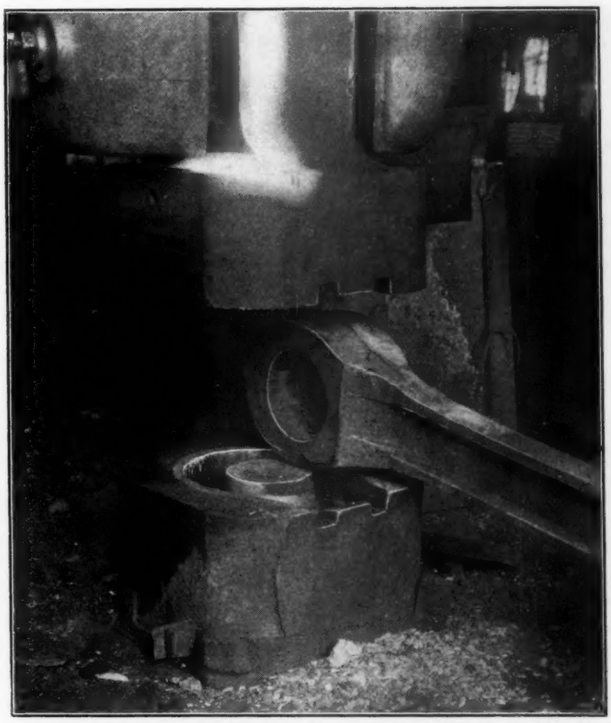


Detail operations in converting strap to solid end main rods

operation, indicated at *A*, consisting of removing the oil cup and cutting the fork ends to the proper length with an oxy-acetylene cutting torch. A U-shaped piece, also shown at *A*, is formed on a bulldozer and fitted in the fork end, the entire end being heated to a welding temperature and welded and formed with dies in an Ajax forging machine to the shape shown at *B*. In this forging operation, the rod is back stopped and the metal must take the shape of the die. It will be noted that the two ends are scarfed for welding to the outer section of the new rod.

A forging is made and bent on the bulldozer, as shown at *C*, and two plates *D* punched, these parts being tack welded to the original main rod. A welding heat is taken on the entire assembly and the weld is made in special dies used under a 1500-lb. Chambersburg steam hammer. The dies and a finished rod are shown in one of the views.

The detailed cost of forging operations in converting the rod is shown in one of the tables as is also the cost of straightening, checking for length and annealing. The



Dies for forming solid end main rods under Chambersburg 1,500-lb. steam hammer

rod is sent to the machine shop, where it is milled on two faces, laid out, bored and finish machined.

A steam hammer heavier than 1500 lb. may be used for this work, but a lighter one would hardly be satisfactory, especially for large rods. To sets of dies have been made to cover the five different classes of Rock Island fork end main rods and in the case of the strap end rods, four sets of dies have been designed which cover 15 motive power classes.

Method used with strap end rods

In the case of strap end main rods, the method of converting to the solid back end type is illustrated in the other drawing. The bolt holes are plugged with the original bolts and the rod cut off to the proper length as shown at *A*, to permit a good scarf on the new solid back end. The rod is then upset in a bulldozer as shown at *B*, the particular shape of end indicated having proven most satisfactory as a seat for the header. (With a straight taper, operation of the header results in too

much wedging action and not enough upsetting.) The main rod is scarfed under the steam hammer, as shown at *C*. The new end for the main rod, forged from billet steel as shown at *D*, is scarfed to suit the rod end. The new solid end forging is then welded to the original main rod in three heats, the center being welded first and then the scarf welded on each side. The rod is straightened, tested for length, annealed and finished in the machine shop, as in the case of the fork end rod.

Cost of converting fork end to solid end main rod

Blacksmith Shop—	
Up-set fork end of main rod for converting	$2.60
Burn and assembly	2.70
Convert fork end to solid end	5.75
Straighten and check for length	1.90
Anneal	1.62
Pro rata 41.57 per cent	$6.06
Machine Shop—	
Slab mill	$2.16
Layout	.36
Bore	1.44
End mill	1.08
	$5.04
Pro rata 48 per cent	2.41
Total labor	19.61
Total pro rata	8.47
Grand total labor	28.08
Material—	
Hammered iron—245 lb. at 1.84 cwt.	$4.51
Seven per cent store expense	.32
Total material	$4.83
Total cost one rod	32.91
Cost of Converting Strap to Solid End Main Rods	
Blacksmith Shop—	
Up-set for converting	$2.60
Manufacture head	9.48
Weld, straighten and check for length	21.85
	$33.93
Pro rata 46.81 per cent	15.88
Machine Shop—	
Slab mill	$2.52
Layout	.36
Bore	1.44
End mill	2.35
	$6.67
Pro rata 37.57	2.51
Total direct labor	40.60
Total pro rata	18.39
Total labor	$58.99
Material—	
Soft steel 320 lb. at 2.25 cwt.	$7.20
Seven per cent store expense	.50
Total material	$7.70
Total cost one rod	66.69

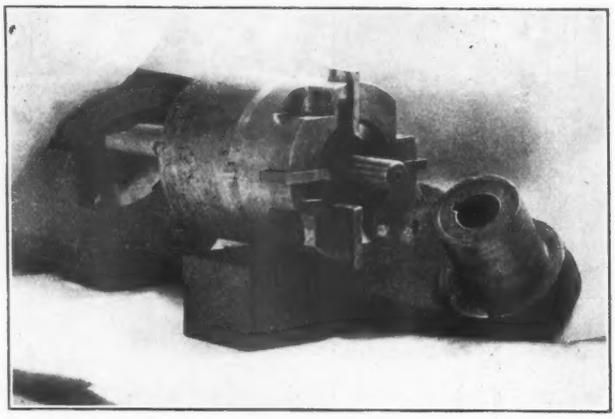
Tool for truing up eccentric crank arms

By J. H. Hahn

Machine shop foreman, Norfolk & Western, Portsmouth, Ohio

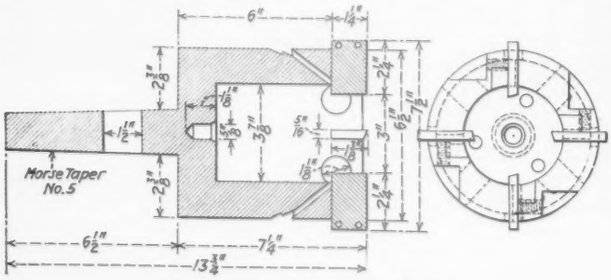
IT has been the practice at this shop in the past to machine, on a boring mill, the boss on eccentric crank arms. Doing such work on this type of machine not only takes unnecessary time but also ties up an expensive machine. In order to eliminate this method, a special tool in the form of a hollow mill was designed to be used on a drilling machine.

The Morse taper No. 5 shank and the body of the tool is made in one piece. The outer circumference of the tool is designed to hold four cutters each of which

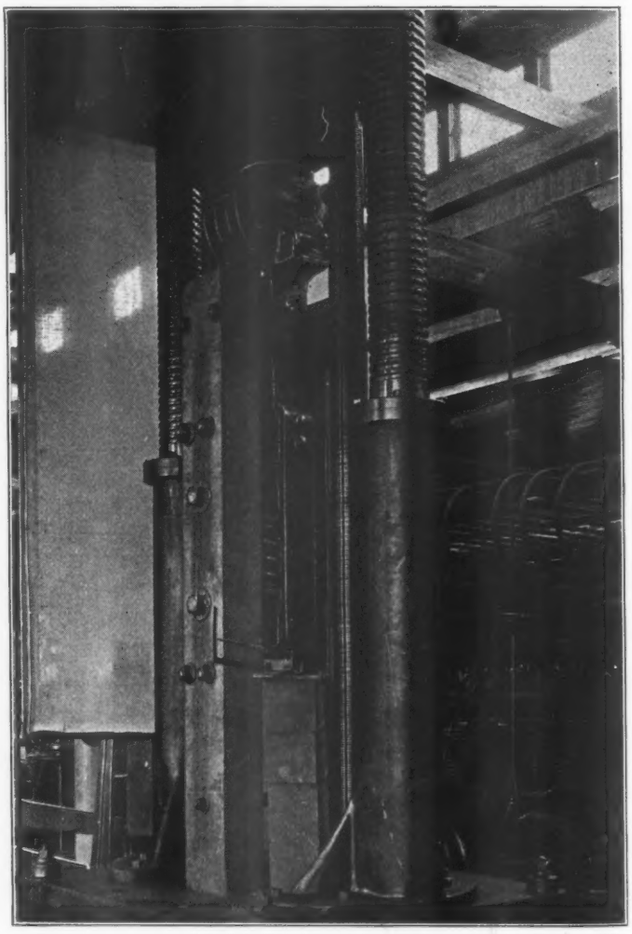


Hollow mill for truing eccentric crank arms

are held firmly in place by two set screws. These cutters are made from discarded Acme diehead cutters. As may be seen from the drawing shown in one of the accompanying illustrations, it is simple and inexpensive to make.



Details of the cutter head



Compression test of a draft gear in a 300,000 lb. Riehle testing machine at Purdue University

Master blacksmiths meet at Cleveland

Improved equipment necessary for modern blacksmith work—Importance of up-to-date heat treating methods emphasized

THE thirtieth annual convention of the International Railway Master Blacksmiths' Association was held at the Hotel Winton, Cleveland, Ohio, August 17 to 19, 1926. There were over two hundred members, guests and supply men registered. With the exception of the last afternoon of the convention, during which an inspection trip was made through the plant of the Ajax Manufacturing Company, Euclid, Ohio, the entire time was devoted to the presentation and discussion of committee reports on autogenous welding, carbon and high speed steel, drop and machine forging, draw bars and draw bar pins, frame making and repairing, heat treatment of steel and iron, reclamation, spring making and repairing, safety first and tools and formers.

Practically all of the speakers emphasized the necessity of improved blacksmith shop equipment in order to economically handle the higher class of work demanded in the maintenance of modern motive power. In the discussion of the reports, especial interest was evidenced on the subject of heat treatment of steel and the making of locomotive springs.

Recognition was taken of the important fact that increasing use of high grade alloy steels in locomotive parts necessitates the use of properly heat treating these parts in order to obtain full advantage of the better grade of steel used.

The members voted to hold the 1927 convention in Buffalo. The following officers were elected to serve for 1927: President, L. C. H. Weideman, C. C. C. & St. L., Beech Grove, Ind.; First Vice-president, W. W. Shackford, A. C. L., Waycross, Ga.; Second Vice-president, J. J. Haggerty, N. Y. C., Albany, N. Y.; Secretary-Treasurer, W. J. Mayer, Michigan Central, Detroit, Mich.

The following are abstracts of several of the committee reports presented:

H. W. Loughridge (P. & L. E.)
President

L. C. H. Weideman (Big Four)
1st Vice-president

W. J. Mayer (M. C.)
Secretary

Autogenous welding

By Lewis Woodrum
Chesapeake & Ohio, Huntington, W. Va.

The term autogenous welding in its present day sense is a general term applying to any method of welding made by a fusion process where the metals to be welded are heated to such a temperature that they will flow together and make a weld without force or pressure. The electric, oxy-acetylene and thermit welding are most common.

The first step in welding is a properly designed joint; not only for strength, but to insure good workmanship. It is not fair to expect any welder, no matter how competent he may be, to make good weld on a poorly designed joint. The essential feature of a good joint is the 90 deg. vee, having space between the points of the vee at least as large as the size wire you are going to weld with. This will allow the welder to get to the bottom of the vee and obtain perfect fusion. Proper fusion of the base metal and the depositing of good weld metal is most important in welding. Use of the proper welding material is also important.

The first thing to be determined is that the welder deposits sound weld metal; in order to do this he must be using a neutral flame. (Avoid using an oxidizing or carbonizing flame). It is also important that he hold the welding torch the proper distance from the work and fill in the weld metal in the proper manner into the molten bath.

It is easy to determine whether these steps are being correctly done by having the operator weld some test pieces. Then bend the pieces in the weld and if the weld breaks you can readily see whether you are getting perfect fusion or if the weld metal is deposited in solid mass or in flakes or layers. There are several important points

to be carried out in welding steel: Use correct flame (neutral flame). Weld with the non-luminous mantle just touching the metal. Heat the steel only just enough to weld it, any more heat is detrimental to the weld and is only a waste of gas. Keep the metal in a molten state as short a time as possible and avoid bringing weld metal to the melting point the second time if possible. Hold filler rods in contact with the weld while adding metal. Hold the welding torch comparatively quiet and work the filler rod. Swing the flame on and off the molten metal, allowing the oxygen in the air to come in contact with it which results in a certain amount of oxidation.

Welding cast iron.—Prepare the weld about the same as you would for welding steel. If the job requires it, preheat it to a dark red. Apply the flame to the bottom of the vee, being sure you fuse the bottom of the vee first and at the same time heat the sides of the vee up to a fusing point, then apply the filler rods, breaking up the oxide flux and raising the impurities with the filler rod. Always be sure to raise all the impurities to the top of the weld where you can float them off. Do not push the impurities to the edge of weld and leave them there as it will cause hard spots. Do not hold the flame on one spot any longer than necessary to fuse it for by doing so you are liable to burn out properties impossible to replace.

The cooling process of cast iron weld.—This is a very important part in cast iron welding after the weld is finished. Heat to a dark red, cover up and allow to cool slowly. If the method as stated above in welding is carried out and the proper care taken in annealing welds after being finished a good job is assured.

The use of tobin bronze.—Tobin bronze is playing a large part in welding on the Chesapeake & Ohio. We have brazed a number of cracked and broken cylinders with very good results. For instance, on running repairs, when we didn't have time to build a furnace around the cylinder and weld with cast iron and take time to allow it to cool slowly we sometimes place a few studs in the vee to tie to—depending on the nature of the break.

We do a lot of brazing on link motion on members having jaws and eye connections such as eccentric rods, radius rods, combination levers, union links, etc. We also build up the sides of main rod-ends to make up the lateral.

Electric welding.—Electric welding is an important factor in the upkeep of the power and reclaiming of numerous parts. We use both methods of electric welding—the metallic arc-welding and carbon arc-welding.

As in other welding it is important to prepare the job properly to be welded. The main points are: First, proper preparation of metal to be welded; second, selection of a proper electrode; third, proper adjustment of current; fourth, holding proper arc length while welding; fifth, proper filling of welded metal; and sixth, heat treatment of welds.

A skillful operator normally maintains a short arc, the result is less material wasted and a better weld obtained due to improved fusion, decreased slag contents and a weld free from porosity.

In electric welding it is important to have the vees chipped clean and free from all scale or oxide and keep the weld brushed out clean at all times.

Frame welding.—We do quite a lot of frame welding with the electric process and have had wonderful results. We have some welds that have been running since 1914. When we weld broken frames the first thing is to see that the frame is properly lined up. Then we tram the frame to keep the proper length. They are vee'd from both sides whenever possible and all scale or oxide chipped off the face of the vee. The break is then either jacked apart or the opposite member heated enough to take care of contraction of the weld. The amount, of course, depends on the size of the frame. Next place a ¼-in. or ⅜-in. plate under the vee which is to extend 1 in. past the corner of vee and about ⅜ in. on each side of the frame. Weld both ends of the plate solid to the frame and then fill up the vee. Use an air hammer and a dull roughing tool, to clean each layer as the weld advances. This does two things, it removes the scale that you could not get rid of by brushing and at the same time stretches and packs the metal by relieving some of the strain.

Welding guides.—We have found by past practice that we get the best wear and quickest job by welding guides with the carbon arc process. Edge up the guides on the worn corners with the metallic arc, then fill in the worn sides with ½-in. filler rods using a carbon arc. This is much cheaper and quicker than either acetylene or metallic arc process.

Carbon and high speed steel

By C. E. Davis
Blacksmith foreman, New York, Chicago & St. Louis

Tool steels fall naturally into two classes, namely, plain carbon and alloy.

Plain carbon steels are primarily mixtures of carbon and iron with minor elements present, such as phosphorus, manganese, sulphur, and silicon. Very small percentages of oxygen, hydrogen, and nitrogen are present, but these last three are impurities and occur only in traces and may be disregarded in standard steel.

The average analysis of all tool steels are covered by the following table:

Carbon	0.45—1.65	per cent
Manganese	0.20—0.50	per cent
Sulphur	0.030 max.	per cent
Phosphorus	0.030 max.	per cent
Silicon	0.10-0.30	per cent

The carbon content of the tool is proportional to the work that the tool must do and the service demanded of it.

A brief table of the carbon content of various tools is given as this summary will be of aid in selecting the correct bar stock for the job in question:

Track bolt dies (water-cooled), hot worked tools—.45–.55 per cent carbon.

Bolt and rivet headers; hot work generally, hot sets, smith-shop tools, flatters, wedges—.55–.65 per cent carbon.

Track tools; smith-shop tools, rivet sets, copper tools, hot drop forge dies—.65–.75 per cent carbon.

Shear blades, hammers, punches, chisels, forging dies, boiler-makers' tools; track chisels, sledges—.75–.85 per cent carbon.

Punches, large cutting dies, mining drills, hard chisels, shear knives, cold work drop dies—.85–.95 per cent carbon.

Taps, reamers, cups, cones, springs, punches, axes, channelling drills—.95–1.05 per cent carbon.

Milling cutters, reamers, taps, trimming dies, saw swages, circular cutters, threading dies, wood working tools—1.05–1.15 per cent carbon.

Small taps, forming and boring tools, twist drills, screw dies, preening tools, drawing dies, mandrels, razors and edged tools, ball races—1.15–1.25 per cent carbon.

Lathe, planer and slotter tools, drawing dies, brass working tools and very hard tools—1.25–1.35 per cent carbon.

Roll corrugating and chilled roll turning tools—1.35–1.45 per cent carbon.

Roll corrugating and chilled roll turning tools and other tools necessitating extreme hardness—1.45–1.65 per cent carbon.

Alloy steels

By the selection of the proper type of plain carbon steel, practically any tool operation can be performed. However, when increased production is desired by employing faster speeds and feeds, or where greater tool life is an advantage, then alloy steels must be employed.

Plain carbon tool steels are alloyed with the following elements either singly or in combination: Tungsten,

chromium, vanadium, cobalt, nickel, molybdenum and uranium. Some efforts have been made to incorporate cerium, tantalum, and other rare alloys with doubtful or inconclusive results.

Alloy tool steels have further divisions, such as, non-deforming oil hardening tool steel, fast finishing steel and high speed steel.

Oil hardening steel will analyze between:

.85	1.00 per cent	carbon
1.00	1.25 per cent	manganese
.40	.75 per cent	chromium
.40	.50 per cent	tungsten
.15	.25 per cent	vanadium

Some brands of non-deforming oil hardening steels contain chromium only; others are combination of chromium and tungsten and yet others which are composed of chromium, tungsten, and vanadium.

Fast finishing tools or, sometimes called semi-high speed steel, occupies a plane intermediate between plain carbon and high speed steel. Steels of this type will withstand more wear and abrasion than straight carbon steels; again, they impart a very smooth finishing cut to cast iron, steel or brass, and are non-deforming when quenched in oil.

High speed steel tools can be run with the nose of the tool red without appreciably affecting the cutting qualities of the tool, whereas, straight carbon steel at this temperature will lose its hardness and be useless. For example, a high speed tool will have practically the same hardness at 1,100 deg. F. as it will have at room temperature, whereas, a straight carbon steel will have a hardness of practically one-third of that which it has at room temperature.

The majority of high speed steels comply with these limits:

Carbon	.60	.75 per cent
Manganese	.20	.30 per cent
Phosphorus	.025 max.	
Sulphur	.025 max.	
Silicon	.25	.30 per cent
Tungsten	13.00	18.00 per cent
Chromium	2.75	4.50 per cent
Vanadium	.35	1.75 per cent

Some high speed steels also contain 3.00—4.00 per cent or cobalt; 0.30—1.00 per cent molybdenum and .20—.75 per cent uranium. For the maximum performance a tungsten content of 18.00 per cent has been found the best. Above this amount increased brittleness is experienced, whereas, below this amount the cutting and wearing properties of the steel are lessened.

Four per cent of chromium has been found by experience to impart sufficient hardness and render the tungsten more soluble. About .80—1.00 per cent of vanadium has been found to confer the most desirable properties to high speed steel. Molybdenum is approximately two to two and one-half times more effective in high speed steel than tungsten. That is, eight per cent of molybdenum will give the same effect as 18 per cent tungsten more soluble. About .80—1.00 per cent of cause a surface softness and therefore has prevented the use of molybdenum in larger quantities. Uranium does not seem to offer any general advantages and there is always the danger present of contaminating the steel with uranium oxide. This oxide would naturally interrupt the homogeneity of the steel and weaken its structure.

Heat treatment of plain carbon tool steel

As is well known the hardening temperature of steel is proportional to the carbon content in the ranges of .10 per cent—.90 per cent. To harden steel it is necessary to heat it above what is known as its critical temperature. This temperature is the point where the compound formed by the union of carbon and iron or iron carbide dissolves in the remaining iron or ferrite to form a solid solution, known, as, austentite. It is the retention of this solid solution or phases of this solid solution at ordinary temperatures which confers upon the steel its hardness. For best results, tool steel should be normalized before hardening. This places the crystalline structure in the best state to receive the hardening treatment.

Naturally the normalizing temperature varies with the carbon content. Steel running .65 per cent—.80 per cent are heated to 1475—1525 deg. F. whereas, higher carbon content of 1.00—1.25 per cent are normalized at 1575—1675 deg. After complete saturation of the heat the steel is allowed to cool freely in the air. For the normalizing and hardening heats the heating can be done in a lead bath, open furnace, or salt bath. The trend in practically all tool shops is towards the use of special salt baths for the heating operations. Salt baths and lead baths are faster heaters than a dry furnace and the tool is free from scale, whereas, heating in a dry furnace ofttimes results in scaling and also decarbonization or soft spots. Again, dry heat furnaces suffer from lack of uniformity resulting in unevenly heated steel. Easily 50 per cent of the trouble from warping can be laid to unevenly heated steel.

Lead baths are objectionable as they are subjected to more temperature fluctuations than salt baths.

Plain carbon tool steel is hardened at temperature ranging from 1380—1550 deg. F. The higher the carbon the lower is the hardening temperatures. After complete saturation of the heat, the steel is quenched in water at 70 deg. F. Freshly quenched tool steel is in a condition of strain and subject to easy breakage, owing to is brittleness. It should be immediately tempered in oil, any other liquid heating medium or furnace and allowed to cool. If it is only desired to relieve strains, tempering is carried out from 350—375 deg. F. For relieving strains and reducing brittleness, temper from 400 to 500 deg. F. To relieve strains and toughen, heat from 500 to 600 deg. F.

At about 600 deg. F., plain carbon tool steel will rapidly soften with consequent loss of cutting edge and life of tool. In fact, drawing at 600 degrees F., causes an approximate loss of 20 per cent in hardness. This loss in some tools is compensated for by the increase in strength and toughness. In tempering, the heating medium should have the largest heat capacity possible, so as to obtain uniformity of the tempering effects. Special salt baths have been devised for tempering operations above 300—350 deg. F. and they are rapidly replacing oil and dry heat furnaces. Oil is objectionable as it sludges, gives off objectionable fumes, danger of fire and necessitates that the work be cleaned after drawing.

Dry heat furnaces cause oxidation and are of small capacity. The biggest defect of dry heat furnace is temperature non-uniformity. You appreciate a poorly drawn tool is defective, as it contains uneven strains and stresses.

Heat treatment of finishing steel

Dies, taps, and other tools which cannot be ground after the heat-treating operation, should be made of this type of steel. When oil hardening, tool steel should be normalized before hardening. To normalize heat uniformly to 1450 to 1500 deg. F. and hold at this temperature to allow complete penetration of heat and maximum grain refinement. Cool slowly from the normalizing heat in lime, mica, informal earth or any similar medium.

To harden the type of steel, heat to 1450—1500 deg. F. and upon complete penetration of the heat, quench in

a light oil. The steel should be removed from the oil when it has fallen to a temperature of 225 deg. F. The selection of the proper quenching oil is of importance, as the securing of the maximum qualities are greatly dependent upon the quenching medium. The oil should be of such a character that it abstracts the heat from the steel in the most even and uniform manner. This uniform quenching tends to eliminate warpage and the setting up of uneven stresses.

The most satisfactory quenching oil will be an entity, instead of a blend of different oils as each individual oil possesses different characteristics. Again, the oil should be of such a nature that it will not oxidize and sludge nor thicken after constant use. This thickening will alter the quenching speed of the oil and result in non-uniform production. Re-heat immediately after quenching to 325—400 deg. F. in oil or salt bath and hold for one-half hour. Quench from tempering heat in hot water and in oil or air for intricate or small sections.

Heat treatment of fininshing steel

This type of steel should be annealed at temperatures of approximately 1450—1525 deg. F., and allow complete heat saturation. To prevent scaling, this heating can be done in a closed box containing carbonaceous matter or preferably, in suitable salt baths. After normalizing, cool slowly in a salt bath, lime, or similar medium. For hardening, heat to 1475—1525 deg. F. soak for heat penetration, and quench in water. Re-heat immediatey in oil or salt bath at a temperature of 300-500 deg. F. according to use of steel. Remove and quench in water or for small sections in air or oil.

Heat treatment of high speed steel

The correct heat treatment of high speed steel may be divided into six operations, namely: Pre-heating, hardening heating, first quench, second quench, drawing and cooling.

High speed steel is pre-heated usually to 1600 deg. F., so that the hardening heating at 2300—2400 deg. F. can be done rapidly to increase production as well as obviate the necessity of keeping the steel at the high heat for too great a length of time. It is more beneficial for the steel to bring it up to the high heat by two steps, instead of subjecting the cold steel to the sudden high heat.

The pre-heating and heating for hardening should be carefully carried out so as to avoid scaling, uneven heating, which cause checking, due to the uneven expansion of the tool. Again, preheating allows all the elements of the steel to enter into solid solution at the same time and thereby eliminates grain growth with the consequent weakening of the tool.

After complete saturation at the hardening temperature of 2300—2400 deg. F. it was formerly the practice to quench by means of an air blast or into oil. The use of an air blast has been avoided as it oxidized the edges, formed pits and impeded subsequent operations. The air blast was replaced with quenching in oil, but subsequent research showed that quenching high speed steel in two steps resulted in the most satisfactory tool.

The modern practice is to quench from the hardening heat into a salt bath at 1075—1175 deg. F. and hold there until the tool reaches the temperature of the bath. This operation eliminates the tendency to warping and cracking without altering the hardness of the steel. As the quenching and drawing of the high speed steel are two distinct and separate operations, the steel is removed from the bath at 1100 deg. F. and allowed to cool freely in air to below 400 deg. F. and replace immediately in the drawing bath at 1075—1175 deg. F. The steel is held here for a time, ranging from 30 min. to two hours, according to its size. Remove and cool in air or if time is a factor, quench in oil.

It might be argued that the draw back at 1100 deg. F. could be eliminated by holding the tool at 1100 deg. F. in the first quench for a longer time. Experiment has shown that such a tool upon subsequent cooling, will be hardened and not drawn, as the final hardening of high speed steel takes place below 500 deg. F.

Grinding and clearance angles

It is best to dress a tool by turning up one end and nearly at right angles to the shank so that the nose will be high above the body of the tool, and it should leave the smith-shop with a clearance angle of 20 deg. When grinding a tool care should be taken to avoid overheating. A stream of water of low velocity should play upon the nose of the tool so as to dissipate the heat formed at the tool nose.

Allowing the nose to become overheated will have the effect of drawing, with the consequent softening. This softening will cause the tool to become dull early in service, thereby, necessitating regrinding often. When tools are ground by hand they should not be held firmly against the wheel, but should be moved over the surface of the emery wheel.

Automatic tool grinders are economical, even in small shops. These grinding machines should have some means of automatically adjusting the pressure of the tool against the grinding wheel. It can be easily seen that the pressure should be so regulated that the tool will not over heat.

In grinding a tool it should be given more side than back slope as the tool can be ground many times more without weakening it, the chips tend to run off sideways without striking the tool posts and clamps. The pressure of the chip tends to deflect the tool in one direction; therefore, a steep side slope corrects this by bringing the resultant line of pressure within the base of the tool, also the tool is easier to feed.

Drawbars and pins

By D. Hayes
New York, Chicago & St. Louis, Chicago

All drawbars, safety bars and drawbar pins are made from double refined iron in accordance with specifications furnished from the engineering department.

In forging drawbars special care is given to heating the billet to a good wash heat. This ofttimes prevents seams and blisters from showing up at the time the bars are finished, thus avoiding any argument as to the working of the material. All new drawbars are annealed after being forged. Then they are taken to the machine shop, holes drilled, and they are ready for service.

All new drawbars when being forged are made ¼ in. larger than the blue print measurements. This gives a safety margin on print sizes which prevents the bar from being made undersize should it be drawn to the length required. Referring to the material from inside of hole to end of bar ½ of material above print sizes is added. This permits the hole to be repaired from the inside without upsetting, which both shortens and repairs the holes at the same time.

The repairing of drawbars is apparently a set method by upsetting the hole and welding a piece around the end. This we are doing at such times that the hole in the bar is worn at the end below print sizes and does not assure a good safe amount of the original material at the end of the hole.

In repairing drawbar pins if the pins are worn from 1/16 to ⅛ in. we upset at the worn part and round up to the original size. If the pins are worn any more than the size mentioned, it is drawn to the following size of pins used. By using the above methods of making and repairing drawbars and pins, coupled with inspection every 90 days, our failures are too few to mention.

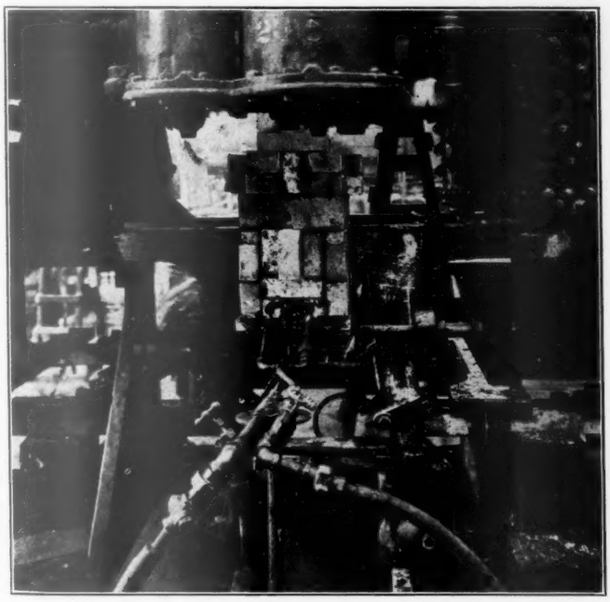
Frame making and repairing

By S. J. Uren

Foreman blacksmith, Southern Pacific, Sacramento, Cal.

Frame making is a thing of the past in the forge shop as the steel foundries have taken up the task of manufacturing cast steel frames, which answers the purpose just as well, at a lower cost per pound than wrought iron frames can be made, and as the locomotives of today are so much heavier than they have been in the past the frames have to be made so much larger that I do not think the foreman blacksmith will have to worry any more about the manufacturing of wrought iron frames.

As cast steel frames are being made for most all new equipment, the question arises as to the best method of repairing when these frames break. There are so many different opinions as to the best method for repairing frames that it is a hard matter to decide which is the best. Good results are obtained from the Thermit method of welding, also there are many that use the electric and others the acetylene, and as we all know that the locomotive is supposed to make a certain mileage before it is sent to the main shop for general repairs, if a frame should break before it makes the mileage that is intended of it, the best and quickest method of repairing the break should be used so that it can be kept in service until such time that it has to be sent to the main shop for its general repairs.



This shows the method of applying the furnace and oil burner for preheating the parts

When an engine is sent to the Southern Pacific Sacramento shops for general repairs the frames are thoroughly examined and if any defect shows up in the frames or there are too many Thermit or electric welds in any one section, a new section is cast and the old section is sawed off between the pedestal jaws and scrapped. The new section is machined and placed in position for welding. As I have had more experience in the oil method of welding than any of the other methods, I will explain one of the methods used for the repairing of a large number of frames.

When a frame is cracked or broken close to the corner of the pedestal jaw in the top rail, we saw the frame between the pedestal jaw and about 12 in. back of the pedestal jaw and also near the center of the leg. This old T-piece is removed and a new T-piece placed in position for welding. The first weld is made in the top rail back of the pedestal jaw, the second through the center of the pedestal jaw and the third through the center of the leg, or if the frame is broken near the corner of the pedestal jaw in the lower rail of the frame an L-shaped piece is made and welded to the lower rail of the frame first and then through the center of the leg, or if a new section has to be made the welds are made through the center of the pedestal jaws. We know by making our last weld through the center of the leg or through the center of the pedestal jaw that we are getting the proper expansion and contraction, thereby leaving no strain whatever in the frame.

View of the frame pedestal jaw, showing the completed weld

When preparing for the weld a jack is used, in some instances, between the pedestal jaws for the purpose of spreading the frame and between the top and lower rail of the frame near the pedestal jaw in other instances. The frame is spread to about a one-inch opening, a wrought iron block one inch thick and ⅛ in. larger than the frame section is placed in this opening. Two 1¼-in. truss rods are fastened to the frame when the weld has to be made in the rail of the frame or through the pedestal jaw. When the weld has to be made through the center of the leg a jack is placed underneath the leg. By screwing up the nuts on the truss rods or pumping up the jack when the parts are brought to the proper welding heat presses the parts together.

The furnace used for heating the parts takes about one hour to construct and is so constructed that the flame continually circulates around the parts to be heated and passes out a small opening at the top. Crude oil is used for fuel and is blown through the burner into

the furnace with about 80 lb. air pressure. When the parts have been brought to the proper welding heat and pressed together, a loose brick in the front and back of the furnace is removed and two rams placed in 90 lb. pneumatic air hammers are put through the openings directly on the welded section and the weld smoothed over. A sudden jerk on an iron rod which helps hold the furnace in position drops the furnace into the pit. Chisels are then placed in the air hammers and the surplus stock that forms on the under side and top rail or the inside of the leg, as the case may, is cut off.

This method of repairing frames at the Sacramento shops has been in practice for some time with good results and very few failures, and the parts welded brought to as near the original size of the frame as possible, leaving no strain whatever in the frame and also leaving the frame within 1/32 in. of the original length. Three-sixteenths of an inch to 5/16 in. is allowed for shrinkage according to the size frame to be heated.

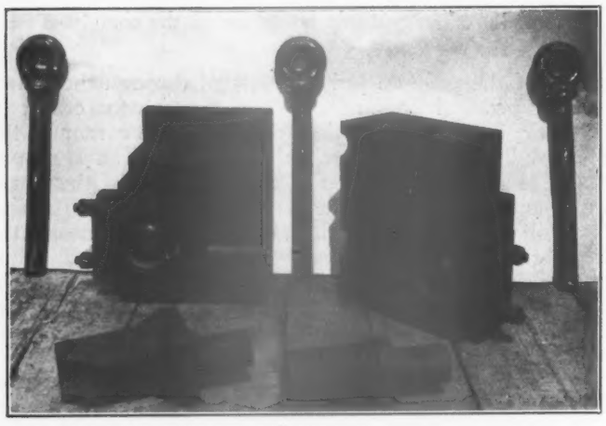
Tools and formers

By J. M. Bradley

Blacksmith foreman, Texas & New Orleans, Houston, Tex.

In our shop in Houston we have quite a number of forging machines, bulldozers, hydraulic forging presses and spring making and repairing machines. Practically all of our car and locomotive forgings that can be, are made on these machines. We do not have any trouble getting formers and dies made, all we have to do is to show that it will pay and we get them. All formers on our bulldozers are made of cast iron and very seldom require machining and so the cost is not high.

Practically every year we have a program to build cars or locomotives and sometimes marine boilers and when I get the drawings and find out just what I can build on

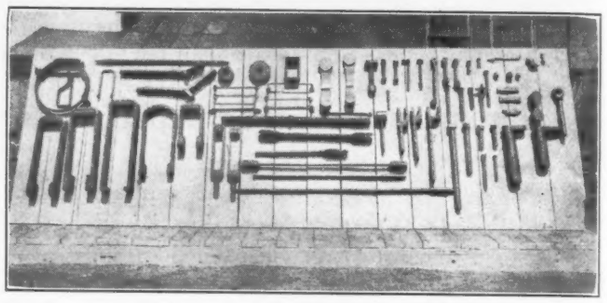


Dies used on forging machine for making eye-bolts

the machines, I submit to the drafting department sketches of the forgings that I wish to make.

One illustration shows an eye bolt made on a 3-in. forging machine out of 1¾-in. round bar stock. The rod is heated, placed on top of the die and bent in the shape of an eye bolt, then placed back in furnace and brought to a welding heat and placed in the bottom step and welded; this makes a first class forging with very little flash except in the eye. We have several size eye bolts made in this way.

Swinging hangers for four wheel truck steel coaches are also made by machine. This hanger was formerly made of 1-in by 4-in. flat iron, one side off-set to form the jaw, but our company adopted open-hearth steel for iron so we are now making them by forging on our hydraulic forging press and finishing in the machines. This is an excellent job as this hanger is drilled and applied and runs until the car is shopped again, when it



Display board showing forgings made by machine at the Houston, Tex., shops of the T. & N. O.

is rebored and bushed and is ready for service again. Another illustration shows a display board of forgings which are made on machines.

Spring making and repairing

By J. B. Ray

Blacksmith foreman, Missouri Pacific, N. Little Rock, Ark.

The first consideration in making springs should be quality. Without quality, regardless of methods and practices, you will fail. Quality is obtainable only by using a grade of steel suitable for this special purpose and good workmanship in handling and above all the correct method of heat treatment when the proper grade of steel has been furnished. Then it is strictly up to the forge shop foreman to see and know that good workmanship and proper heat treatment is applied. The old slip-shod method of heating plates for setting must be abandoned and furnaces must be so constructed that the fire will not impinge on the steel. Temperatures above 1675 deg. F. should not be permitted for the purpose of setting plates to the desired radius. When plates are set they should be laid aside and allowed to cool, then recharged into the furnace and heated to 1475 deg. F. quenched in a suitable quenching medium, then go into the drawback. They should remain in the drawback at a temperature of approximately 760 deg. F. for from 15 to 45 min. dependent upon the size of the steel.

I have purposely omitted saying anything about the various operations necessary—such as cutting, punching and nibbing, all of which is essential in spring making. But the facilities furnished for doing this work vary so greatly in railroad shops that it is incumbent upon the forge shop foreman to do the best he can with equipment at his command. It is a question whether or not it is economical to strip the springs from the band or cut the bands off and consign them to the scrap pile. I believe it to be the better plan to cut them off and make and apply new bands. All bands should be applied by hydraulic pressure. Another mistake usually made is to cool the bands in water after pressing them on. This should not be permitted. Each and every spring should be thoroughly tested after the band is on.

As to making new bands. There are, to my knowledge, only two ways of forging bands economically in large quantities; one is to bend them on a bulldozer or forging machine and weld them in the forging machine, or roll them out into a U-shape on the bulldozer and weld under a suitable type of power hammer. Both practices are good and the costs are practically the same.

General foremen's program is well balanced

Subjects of interest to both car and locomotive men will be presented at annual meeting

THE annual convention of the International Railway General Foremen's Association will be held at the Hotel Sherman, Chicago, September 7 to 10, inclusive. It is not difficult to get enthusiastic about the program of the meeting which has been designed to exclude matters of more or less secondary importance and promote discussions of at least a few of the many important and difficult problems which confront railway general foremen in the work of the car and locomotive departments.

The opening address will be a discussion of "The Possibilities of the General Foremen's Association" by E. L. Woodward, western editor of the *Railway Mechanical Engineer*, followed by President Warner's address and the report of the secretary-treasurer. At subsequent sessions, the convention will be addressed by such men as C. L. Dickert, superintendent of motive power, Central of Georgia; D. C. Curtis, chief purchasing officer, Chicago, Milwaukee & St. Paul; F. H. Becherer, superintendent car department, Central Railroad of New Jersey; and M. A. Hall, superintendent of machinery, Kansas City Southern. These officers, all of whom are well known in the railway mechanical world, will speak on selected topics and no general foreman who finds it at all possible to get away from the regular routine of his daily task can afford to miss hearing them.

The program, a detailed report of which follows, is in many respects the most interesting and valuable in possibilities of good for the railway service that has ever been provided by the International Railway General Foremen's Association. Help the good work which this association is doing by attendance at the convention and active participation.

H. E. Warner (N. Y. C.)
President

C. A. Barnes (C. & N. W.)
1st Vice-Pres.

F. M. A'Hearn (B. & L. E.)
2nd Vice-Pres.

W. F. Hall (C. & N. W.)
Secretary

The convention program

Tuesday, September 7

9:30 a. m.

Address of welcome by Mayor Dever.
Response by Pres. H. E. Warner.
Address, "The possibilities of the General Foremen's Association," by E. L. Woodward, western editor, *Railway Mechanical Engineer*.
Response, J. N. Chapman.
President Warner's address.
Report of secretary-treasurer.
Appointment of committees.

2 p. m.

Topic No. 1—Balancing shop sub-departments.
Locomotive department, E. F. McCarthy, chairman.
Car department, A. H. Keys, chairman.
Discussion.

Wednesday, September 8; 9 a. m.

Address by L. C. Dickert, superintendent motive power, C. of G.
Response, A. H. Keys.
Response, T. C. Gray, supervisor of apprentices, Missouri-Kansas-Texas.
Topic No. 2—Development of the mechanic, R. J. Farrington, chairman.
Discussion.

2 p. m.

Topic No. 3—Maintenance of refrigerator car, J. N. Chapman, chairman.
Discussion.
Election of officers.

Thursday, September 9; 9 a. m.

Address by D. C. Curtis, chief purchasing officer, Chicago, Milwaukee & St. Paul.
Response, F. M. A'Hearn.
Topic No. 4—The general foremen's responsibility for material surplus or shortage, F. M. A'Hearn, chairman.
Discussion.

2 p. m.

Address by F. H. Becherer, superintendent of car department, C. R. of N. J.
Response, W. F. Lauer.
Topic No. 5—Developing railroad shop foreman, J. R. Leveridge, chairman.
Discussion.

Friday, September 10; 9 a. m.

Address by M. A. Hall, superintendent machinery, K. C. S.
Response, F. B. Harmon.
Topic No. 6—Modern shop equipment as a factor in increased production, H. W. Harter, chairman.
Discussion.
Reports of committees.
Unfinished business.
New business.
Adjournment.

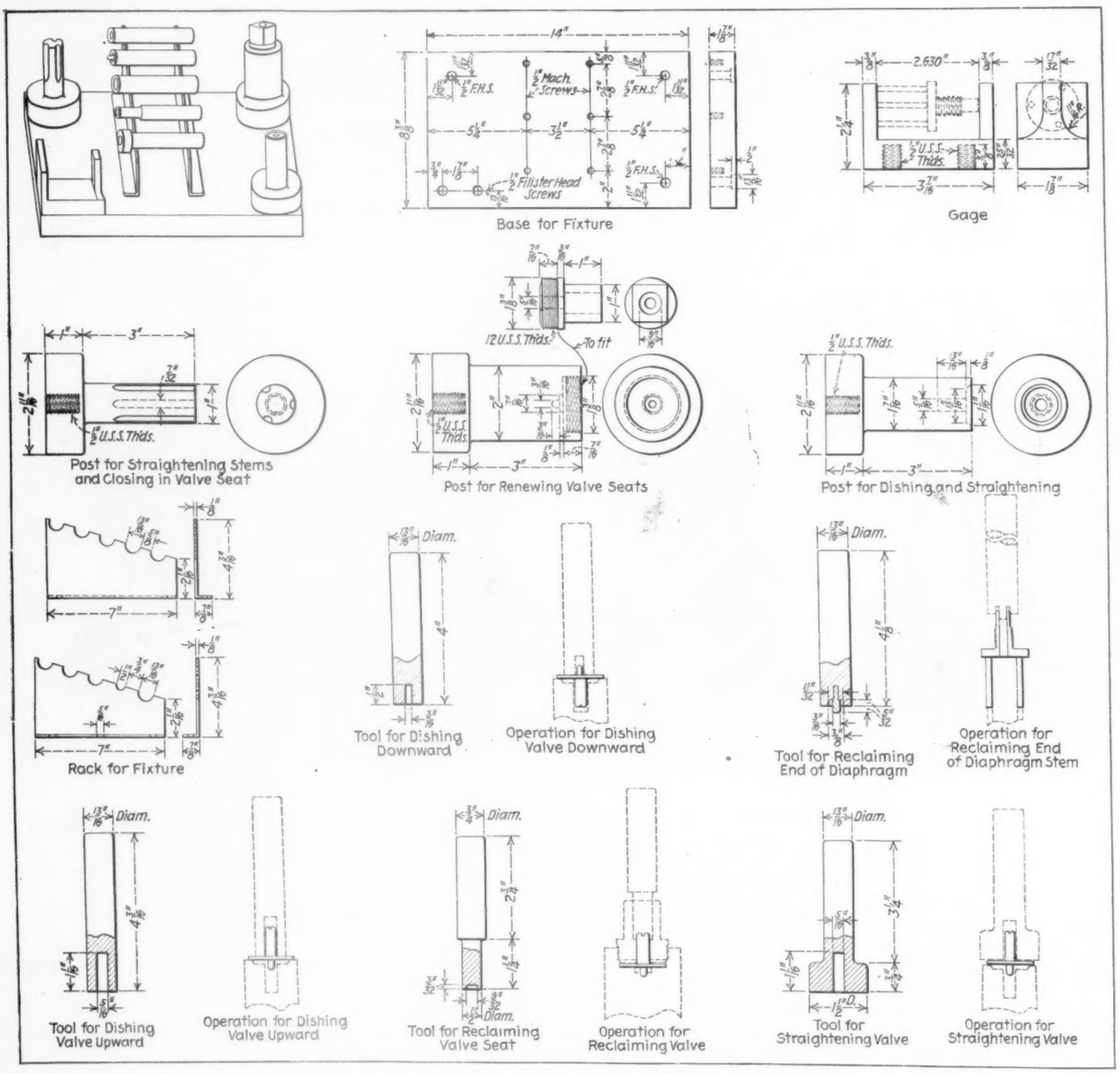
Tools for reclaiming signal valves

THE fixture and tools, shown in the drawing, are used in reclaiming the BA signal valves of the New York Air Brake Company. Referring to the drawing, the fixture for holding the assembled tools is shown in the upper left-hand corner. The base for the fixture is shown at the right and the rack for holding five of the round tools is shown at the left in the second row from the bottom of the drawing.

Beginning with the tool shown in the top row at the upper right-hand corner; this tool is used as a gage for the diaphragm stem, known as part SV25. The tool at the left in the third row from the bottom is a post for straightening the stems and closing in the valve seat of the diaphragm. The next tool in the same row is a post for renewing the valve seat on the valve, known as part SV8. The last tool in the third row is a post for dishing and straightening part SV8.

The two drawings in the center of the second row from the bottom show the tool for dishing the valve, part SV8 downward, and how the tool is used for this job. The last two drawings show the tool for reclaiming the end of the diaphragm, part SV25, and the method of using the tool.

In the bottom row, three tools are shown, the first of which is a tool for dishing the valve, SV8, upward in the manner shown in the drawing at the right of the tool. The tool in the center is used for reclaiming the valve seat, part SV8, and the method used is shown at the right. The last tool, shown at the lower right, is used for straightening the valve, SV8, for which the method of operation is also shown. Providing a rack for the tools makes it easier to find them when wanted.



Drawing of fixture and tools used in reclaiming BA signal valves

Tool foremen have interesting program

Reports to be presented on new labor-saving tools, training of men, and standardization

THE program arranged for the fourteenth annual convention of the American Railway Tool Foremen's Association to be held at the Hotel Sherman, Chicago, September 1, 2 and 3, covers practically every important phase of tool room work and administration. Tool foremen and others interested in the general subject of the railroad shop tool room who attend the convention this year will find considerable in the way of helpful information and practical ideas that they can profitably take back home with them. Six reports of standing committees on the subjects of new labor-saving tools and devices for the air brake department, training of men suitable for toolroom work, standardization of present special boiler taps, new tools and safety devices for the car department, general locomotive shop kinks and devices, and standardization will be presented. The report on "Training men suitable for toolroom work" is a new subject on the convention program of the association. Training men is an important part of the toolroom foremen's job and the report and subsequent discussion should be interesting.

L. A. Richardson, general superintendent of motive power, Chicago, Rock Island & Pacific, is scheduled to make the opening address which will be followed by the address of President E. A. Hildebrandt, machine shop foreman and formerly tool foreman of the Big Four at Beech Grove shops, Indiana. At the morning session on the second day of the convention, Edwin W. Ely, assistant director, Department of Commerce, will address the association on "Simplification, a new tool for the tool foreman." Mr. Ely, being associated with Secretary Hoover in the campaign to prevent waste in industry will, in all probability, have a number of excellent suggestions as to how the toolroom foreman can prevent waste in the work of his department.

Following is a detailed report of the program. Abstracts of the various reports and addresses together with a report of the more important business transacted during the convention will be published in subsequent issues.

WEDNESDAY, SEPTEMBER 1

9:30 a. m. (Daylight Saving Time)

Address by L. A. Richardson, general superintendent of motive power, Chicago, Rock Island & Pacific.
Address by President E. A. Hildebrandt.
Report of secretary-treasurer.
Appointment of committees.
Unfinished business.
New business.

2 p. m.

Report of Standing Committee on New Labor-Saving Tools and Devices for the Air Brake Department, H. Otto, chairman.

E. A. Hildebrandt (Big Four)
President

O. D. Kinsey (C. M.& St. P.)
1st Vice-President

E. A. Greame (D. L. & W.)
2nd Vice-President

G. G. Macina (C. M. & St. P.)
Secretary

Report of Standing Committee on Training of Men Suitable for Toolroom Work, J. J. Sheehan, chairman.

THURSDAY, SEPTEMBER 2

9:30 a. m.

Address, "Simplification, a New Tool for the Tool Foreman," by Edwin W. Ely, assistant director, Department of Commerce.
Report of Standing Committee on Standardization of Present Special Boiler Taps, O. D. Kinsey, chairman.
Report of Standing Committee on New Tools and Safety Devices for the Car Department, G. Reichart, chairman.
Election of officers.
Special visit to exhibits.

FRIDAY, SEPTEMBER 3

9:30 a. m.

Report of Standing Committee on General Locomotive Shop Kinks and Devices, J. E. Carroll, chairman.
Report of Standardization Committee, E. J. McKernan, chairman.
Report of Committee on Auditing, Committee on Thanks, and other special committees.
Selection of place for annual convention.
Adjournment.

The Reader's Page

Have You a Question? Ask it
Have You an Opinion? Express it

One method of casehardening a valve motion link

LOWELL, MASS.

TO THE EDITOR:

On page 305 of the May issue of the *Railway Mechanical Engineer*, Mr. McCabe asks for information pertaining to the casehardening of Walschaert valve gear links. It is our practice to take these links after they have been machined, and put them in a casehardening pot sufficiently large to pack the link. Houghton's Pearlite compound is used, putting a layer of Pearlite about 4 in. deep on the bottom of the pot and then placing the link on its edge in the pot, packing about 3 in. or 4 in. of Pearlite around the link. The pot is then placed in the furnace and held at a temperature of 1,700 deg. F. for eight hours, after which it is taken out and quenched in a large tank of Houghton's No. 2 quenching oil. The link is left in the quench until cold, after which it is annealed around the cheek plate and radius bar holes with an acetylene torch to relieve the strain at these points.

We have been using this method for about 1½ years and have had no links warp or get out of shape.

W. J. WIGGIN,
Blacksmith foreman

Is this the solution to the hot box problem?

HAMMOND, Ind.

TO THE EDITOR:

A popular subject for discussion among various railroad clubs at the present time and a favorite subject in the years gone by is our old pal the "hot box." The lubricating engineer of the A. B. C. railway reads a paper before the Podunk Carmen's Club. The paper is a good one and is thoroughly discussed. The author of the paper is given a rising vote of thanks and the members of the Podunk club "gird their loins" and go forth to do battle with their common enemy.

The expert in charge of lubrication on the X. Y. Z. railroad prepares and reads a paper before the Big Town Railway Club; subject, "Hot boxes, their prevention and cure." He is given a vote of thanks, etc. Some of the papers are really well prepared and probably are understood by most of the club members. Others are technical; oh, very technical indeed! It is doubtful sometimes if an occasional paper is understood even by the gentleman who prepared it.

In their efforts to find a method of overcoming the friction between the journal and bearing, so many gages to measure the bearings, keys, journals, boxes and dust guards have been designed that the journal box attendant would need considerable assistance if he tried to use them all. One expert says don't do this; another says don't to that. And after all is said and done they are only hoping for a reduction in delays caused by hot boxes. But to paraphrase the song "The little hot box on the railroad keeps burning the mileage away."

For many years no change has been made in the method used in affording lubrication to car journals. In a comparatively short time the capacity of the car has been doubled. The cry for speed and more speed is increasing. The more weight and speed means more friction, which in turn spells more freight car hot boxes.

This may be treason, but the writer wonders if the time isn't near when the old brass and packing method of the present will not have to give way to the modern roller bearings.

The initial cost would be high, but after reviewing the results in the motor industry, it might finally be the cheapest.

H. R. RICE.

The consequences of valve motion failures

TOPEKA, Kan.

TO THE EDITOR:

I read in the August issue of the *Railway Mechanical Engineer* a letter in reply to C. M. Lee by W. T. Speak, regarding a broken union link pin on a Walschaert valve gear, which caused breakage of the cylinder casting, in which the latter asks for opinions as to the correctness of his statement.

I believe Mr. Speak is correct. The union link not only transmits the movement of the crosshead to the combination lever and, thence to the valve, but it acts as a support for the reaction from the movement of the valve by the radius rod, which is transmitted from the eccentric rod, through the link to the radius rod. The radius rod connection at the link block serves the same purpose for the movement of the valve derived from the crosshead through the union link and the combination lever. Without the reaction of both of these points, the valve does not move. The failure of any part or connection between the link block and the motion plate on the crosshead, causes a like consequence.

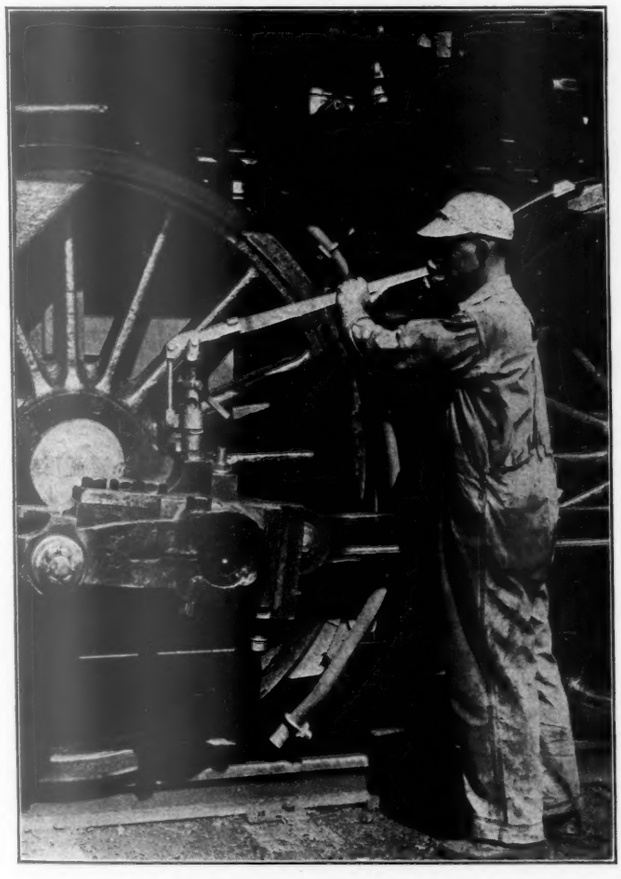
Should the valve stop on center with the ports closed, all rings being in good condition, the high compression developed with the engine running at high speed would have a tendency to break the cylinder casting, blow out a cylinder head or cause a disastrous failure at a weak point. The chances are that the valve would not stop in such a position once out of a hundred times, but it seems possible that should it stop as stated, the results could be as stated.

The careful inspection of these parts should be impressed upon all inspectors and foremen and the costly results of failure explained.

JOHN E. MCGAFFIN,
Machinist gang foreman, A. T. & S. F.

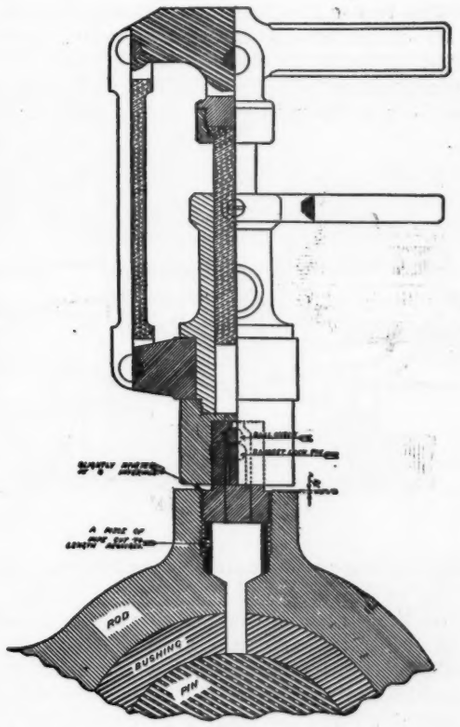
High pressure grease gun

THE device shown in the illustration and known as the Spee-d high pressure grease gun has been used quite successfully for lubricating connecting rod bearings on the locomotives of a southern railroad for nearly four years. This grease gun, a half-section of which is shown in the drawing, is being marketed by the Reliance Machine & Stamping Works, Inc., 900 Tchoupitoulas street, New Orleans, La.



Lubricating a side rod bearing with the Spee-d high pressure grease gun

It consists essentially of a tool steel base which fits over the Spee-d rod cup filler neck, a piston for forcing grease into the bearing and a handle for operating the piston. Screwed into the top of the base is the piston casing in the side of which is a large hole through which the grease stick is inserted. A short handle is secured to the top flange of the piston casing, as shown in the drawing, for the convenience of the operator when applying or removing the grease gun from the rod cup filler neck. The piston is pivoted to the operating handle which in turn is fulcrumed to a collar. The collar fits around the bottom of the piston casing and can be turned freely in either direction with the piston operating



Sectional drawing of the Spee-d grease gun applied to the rod cup filler neck

handle. This permits flexibility in operation, especially if the grease gun must be operated between a side rod and driving wheel, where the clearances are close.

The gun is held in place on the rod cup filler neck, as shown in the drawing, by means of a bayonet lock pin. In fitting up a locomotive for the use of this device, Spee-d rod cup filler necks are installed on all bearings in place of the ordinary grease plugs. In so doing a short piece of pipe cut to the required length is inserted in the grease cup and the rod cup filler neck is then screwed down tight against the top of the pipe and riveted or welded in place.

A bearing is lubricated by the operator securing the gun in position on the rod cup filler neck and inserting a formed stick of pin grease through the hole in the side of the piston casing, the end of the piston being raised above the hole. The piston is then brought down and the pin grease inside the hole is cut off and forced down to the bottom of the piston casing, this operation being repeated until the piston casing is filled up to the hole. The operator then forces the grease down into the bearing by means of an extension lever which fits on to the piston operating handle. The grease is prevented from escaping by the ball check in the rod cup filler neck, shown in the drawing.

The use of Spee-d rod cup filler necks in conjunction with the Spee-d high-pressure grease gun, enables the applying of a pressure of 4,500 lb. per sq. in., if necessary to force grease having a hard consistency to parts of the bearing requiring lubrication that cannot be lubricated properly and efficiently by ordinary methods. It is claimed that the labor time for filling rod cups can be cut from 32 minutes to 5 minutes per locomotive with the use of this device.

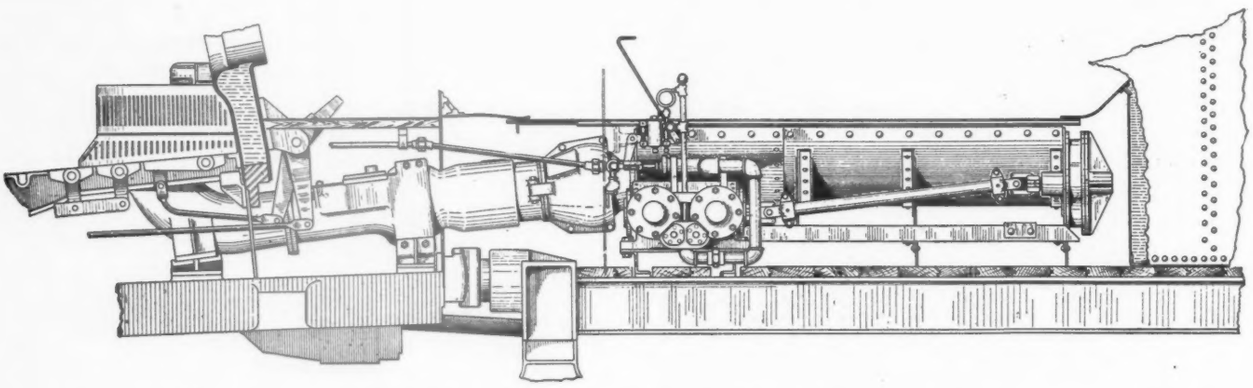
Standard stoker engine placed on the tender

IN 1924 the Northern Pacific uncovered what is probably the greatest lignite coal deposit in the United States, if not in the world. Believing that this fuel could be burned to advantage, and economically as compared with other fuels (oil, sub-bituminous and bituminous coal) then in use, the Northern Pacific began making some experiments, the results of which were so satisfactory, that they immediately began making preparations to use this fuel on an extensive scale. Owing to its comparatively low B.t.u. value, however, it was found advisable to equip all road locomotives with mechanical stokers.

Among other locomotives to be so equipped were a number of the Pacific type, on which the actual load carried by the trailer axle was already practically up to the permissible limit (64,500 lb.), which made it necessary to reduce the weight of that part of the mechanical stoker carried on the locomotive to the lowest possible minimum.

Inasmuch as the duPont-Simplex type B stoker consists of two separate units, viz., the stoker driving engine and the conveying system, and as these units are not integral, thus permitting an optional location of the stoker engine with reference to the conveying mechanism, the mechanical engineer of the Northern Pacific suggested transferring the stoker drive engine to the left front corner of the tender. In collaboration with the Standard Stoker Company, Inc., the road worked out an application which was tried in service.

Comparing the standard application having the stoker engine located on the rear of the locomotive, with the application illustrated, showing the stoker engine located on the tender, it will be seen that the transfer of the stoker engine not only solved the weight problem, but further simplified the stoker in that it eliminated the universal drive shaft between the locomotive and tender, which consisted of two universal joints and the driving and driven telescoping members. The total reduction in weight carried on the locomotive is the weight of the stoker engine and its supporting bracket, the reversing valve and piping, the stoker exhaust pipe leading from the stoker engine to the front end, and approximately one-half the weight of the universal drive shaft. Aside from the stoker engine, which weighs complete, 1,320 lb., the other weights are variable, depending on the type of locomotive, size of supporting bracket, length of exhaust pipe, etc. Generally speaking, the total weight removed from the locomotive is said to be approximately 1,974 lb.



Stoker driving engine located at the left front corner of the tender—Weight removed from the locomotive, 1,709 lb.

In transferring the stoker engine to the tender, the supporting bracket is eliminated as the stoker engine is supported on angle irons attached to the tender frame sill. Thus, the weight added to the tender equals the weight of the stoker engine, the reversing valve and piping, the short section of stoker exhaust pipe, and the two supporting angle irons, or a total of approximately 1,355 lb.

In the ordinary water bottom type of rectangular

tender cistern, approximately 165 gallons, or 1,375 lb. of water is displaced by the stoker engine, thereby leaving a perfectly balanced condition on the front tender truck.

The exhaust steam from the stoker engine is discharged into the cistern. The discharge end of the pipe is about two-thirds of the way down so as to avoid heating the water when it becomes low, beyond the lifting capacity of the injector. While the temperature of the feed water is raised by the heat in the exhaust steam, usually about 13 deg., at no time is the temperature increased to such a point that the injector will not handle it. The weight of the steam discharged into the tender varies with the amount of coal delivered, and is equal to 166 lb. for 2,800 lb. of coal, to a maximum of 370 lb. when delivering 16,000 lb. of coal. Thus, the stoker engine returns to the tender in the form of exhaust steam, from 20 to 40 gal. of water per hour, restoring the water sacrificed in making room for the stoker engine.

The stoker engine is lubricated from a tap in the main lubricator in the cab just the same as with the standard application. No difficulty has been experienced in obtaining perfect lubrication. When the stoker engine is at rest any condensation that may be obtained in the stoker engine steam pipe, which consists of a flexible pipe having three universal joints, is taken care of by means of an automatic drain cock located at the lowest point of the piping system. Similar provision is made to take care of the condensation that may occur in the stoker engine exhaust pipe. Any possible syphoning action in the exhaust pipe is taken care of by a suitable vent.

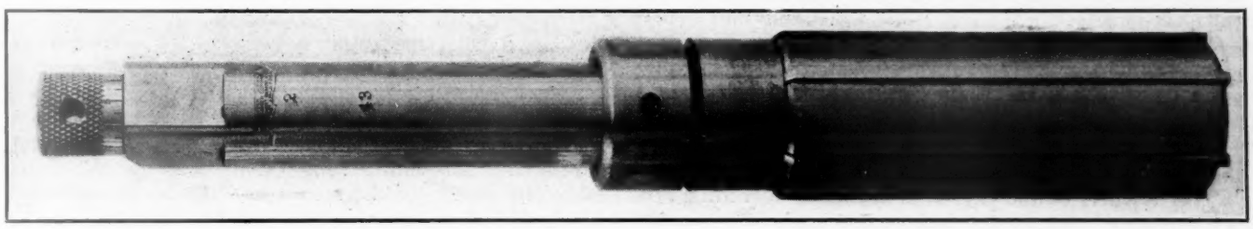
While an auxiliary lubricator is shown in the illustration, this was applied only during the first application, but has since been found to be unnecessary.

The stoker engine in this location is more accessible than when located under the locomotive deck. It also leaves that part of the deck, usually occupied by the stoker drive mechanism, free for the application of any other auxiliary devices, such as shaker rigging, train control, etc.

Adjustable expanding hand reamer

THE blades of the adjustable hand reamer manufactured by the Foster-Johnson Reamer Company, Elkhart, Ind., expand parallel and may be expended when inserted for their full length into the work. The adjustments of the blades are effected through the medium of the knurled nut located at the top end of the reamer. The bottom part of the nut is turned and graduated to read the amount of expansion or contraction in thousandths of an inch. The removal of the reamer from the work is effected through contracting the blades and lifting them straight out of the work with little effort.

The blades of the reamer, when expanded in the work do not enter the metal, but are only firmly seated against the walls of the hole until revolved. During the first quarter revolution the blades will feed out to the full depth of the cut to which they are adjusted by the knurled adjusting nut. This is accomplished by the spring collar.



The Foster-Johnson hand reamer, the blades of which may be expanded while the reamer is inserted in the work

These reamers are built in five sizes, from 1⅜ in. to 4¾ in., and the range of expansion varies from ⅛ in. on the 1⅜-in. reamer to ¼ in. on the 4¾-in. size.

Fully enclosed Diesel engine for locomotives

PARALLELING the development work that is being carried on in the design and construction of large Diesel engines for passenger and freight locomotives, the Foos Gas Engine Company, Springfield, Ohio, is now building industrial Diesel engines with from two to eight cylinders, a power range of from 45 to 475 hp. and an operating speed range of from 400 to 900 r.p.m. The smaller units are designed primarily for cranes and shovels and the larger for rail cars and small locomotives.

It is anticipated by the builders that the application of these Diesel units to rail cars and small locomotives will materially reduce the operating cost per mile as compared with gasoline engine operating cost. The new Diesel engine, with its inherent fuel economy, and increased dependability over gasoline engines, on account of more substantial engine construction, slower speed, and more favorable operating characteristics, will, it is anticipated, make possible a further reduction in fuel mileage cost.

An exterior inspection of this unit does not identify it as a Diesel engine as it is entirely enclosed and no moving part is visible. This has been done to provide a power unit for cranes and shovels. To operate successfully in such equipment any engine should be completely protected from dust and dirt and any foreign matter that might get into the bearings and other working parts. The complete enclosure of the engine also saves it from the danger of having tools or other heavy objects fall into the working parts and confines the lubricating oil that is circulated through the engine. The

new unit is designed so that the lubricant can not leak from any part.

While completely enclosed, the new engine is not inaccessible. Large cover plates are provided on both sides, opposite the crank throws, which give access to the lower part of the main cylinder frame. The top of the engine is provided with cover plates that may be lifted up for inspection of the heads, the valves and the valve mechanism.

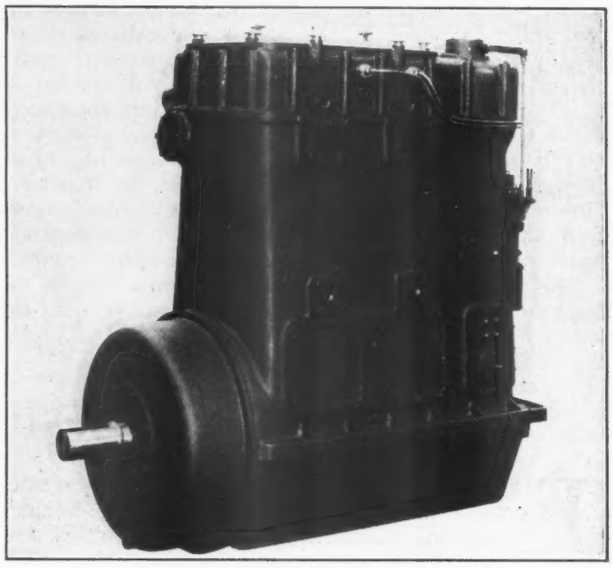
The Foos industrial Diesel is a four-cycle engine and operates on the full-Diesel combustion cycle. A cross section of the engine indicates a plain Diesel combustion chamber; in other words, the head and piston top are flt, there being no recesses or pre-combustion cups of any type. Fuel for combustion is injected into the combustion chamber vertically at the axis of the cylinder. Atomization of the fuel is secured by the mechanical injection principle.

The designers have given considerable attention to the matter of valves and valve gear. Four valves are provided in each head, two for the exhaust and two for the inlet. At the height of the head of the main box frame, which houses the entire unit, a recess in the casting provides the air inlet manifold, and the air inlet valves are located in the head adjacent to the front side of the engine. A passage through the main box frame at the back of the engine is provided for the exhaust gases to enter an exhaust header. For valve operation a camshaft runs the full length of the engine at the height of the cylinder heads. The cam shaft drive involves the use of a silent chain driven directly from the crank shaft.

The moving power plant, as the prime mover of the rail car may be considered, must be simple and accessible. This unit is arranged so that any of the valves or the valve levers may be removed without disturbing any other portion of the mechanism. Throughout the engine, means have been provided that any minor adjustment may be made without difficulty, and without the removal of any heavy engine parts.

The flywheel of the engine is enclosed, operating in a bell housing. All of the fuel pumps and the governor are completely housed, giving them the same protection as is offered the other main working parts of the engine.

A central lubricating oil system furnishes oil to every bearing in the engine under pressure. In the lower part of the bed plates a trough is provided where the lubricating oil is collected. An oil pump picks up the lubricant, puts it under pressure and distributes it to all



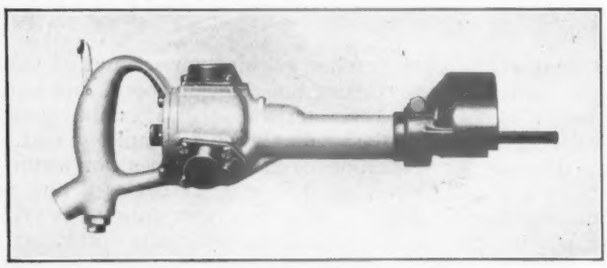
The Foos type L 66 hp. Diesel engine

the bearings of the engine. No oil or grease cups are used.

The Foos Industrial-Diesel has an operating speed from 400 to 900 r.p.m. Tests that have been made at the factory indicate complete combustion is secured throughout this entire range using low grades of fuel oil. The design of the sprays and the fuel system as a whole is such as permits the use of oils having a low gravity.

Small pneumatic grinders

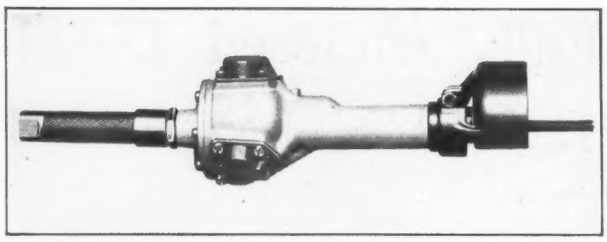
A SMALL size of pneumatic grinder has been placed on the market by Ingersoll-Rand Company, 11 Broadway, New York. This size meets the demand for smaller, lighter, higher speed grinders for light grinding work, polishing and buffing. The new



The No. 61 style pneumatic grinder fitted with the pistol grip outside trigger handle

size is available in two styles. The No. 61 style has a pistol grip outside trigger handle while the No. 62 has a rolling type throttle handle. The motor used is of the same design which has been used in the larger sizes of Ingersoll-Rand grinders.

The motor has three cylinders spaced about the center



The No. 62 style pneumatic grinder fitted with a rolling type throttle handle

line of the spindle and all delivering power to one crank pin. A tool steel crank pin sleeve that is easily and cheaply renewed, fits tightly over and removes all wear from the crank pins. Vibration is entirely eliminated and a steady torque is transmitted to the spindle even when the tool is throttled to a very slow speed.

The entire working mechanism of the motor may be opened up for inspection by simply removing six cap screws and lifting off the handle. All parts of the motor are then accessible. Each of the three cylinders of the motor is a part separate from the body of the machine and may readily be removed if desired. All three cylinders are interchangeable and renewable.

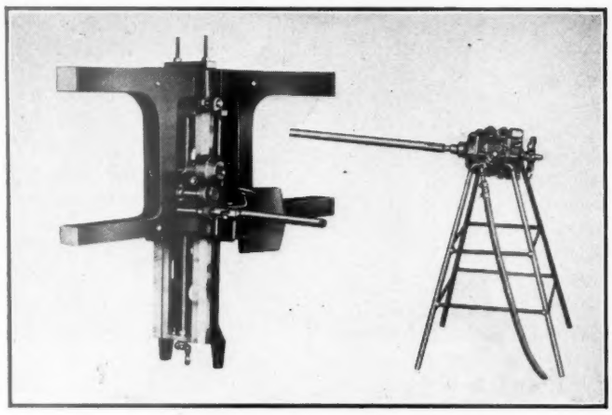
The motor operates in a bath of lubricant so that all the moving parts are constantly immersed. Both the motor and the wheel end of the grinder are entirely enclosed to keep dust and dirt from the working parts.

The following are some of the principal dimensions of the grinders:

Size	61	62
Free speed r. p. m.	6,000	6,000
Weight, pounds (with wheel guard)	8½	9½
Length overall, inches	18½	21¼
Diameter wheel end of spindle, inches	½	½
Maximum width wheel will take, inches	2	2
Distance from side to center of spindle, inches	2	3
Size hose recommended, inches	½	½

Micro portable locomotive frame jaw miller

THE Micro Machine Company, Bettendorf, Iowa, has developed a frame jaw miller, intended for milling the plane surfaces against which the locomotive shoes and wedges bear. This machine takes the place of filing, shipping, and hand-grinding methods, and produces a maximum bearing surface in a minimum time. It has a maximum milling length of 33 in. and a width of 7 in. It mills the full length of the jaw and finishes the top radius complete.



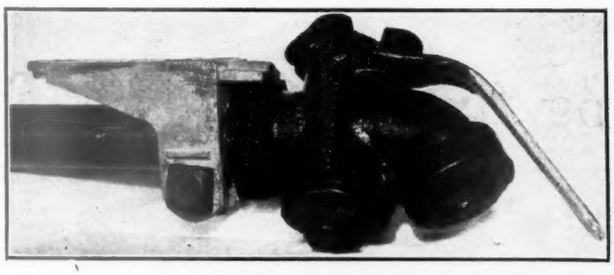
A machine for milling frame jaws up to 7 in. wide by 33 in. long

The sliding cutter head actuates on a heavily ribbed main frame which is 11½ in. wide by 40 in long. A take-up gib is provided for wear. The spiral cutter which is provided with locking screws, is held in bearings of an eccentric design for increasing the depth of cut. The bearings are kept in line by means of a double-pinion shaft, which is also used for increasing the eccentric throw. This shaft is actuated with a wrench from the operator's side. The vertical feed of the cutter head is accomplished by means of a threaded worm gear, driven from an intermediate gear through a shaft and worm, which revolves on a stationary screw. A handle for lowering the cutter head is provided at the bottom.

The mounting is accomplished by drawing the machine tight against the horizontal top section of the frame jaw with a clamp. The lower portion is supported with an adjustable alining bracket and screw placed between the rear side of main frame and the opposite jaw face. The machine is driven through a universal shaft 6 ft. long, by a 300 r. p. m. air motor, mounted on a stand, as shown in the accompanying illustration.

Pipe clamp and angle cock holder

Mudge & Company, Railway Exchange building, Chicago, has placed on the market a pipe clamp and an angle cock holder designed to hold effectively these parts in their proper position. They are made of forged steel

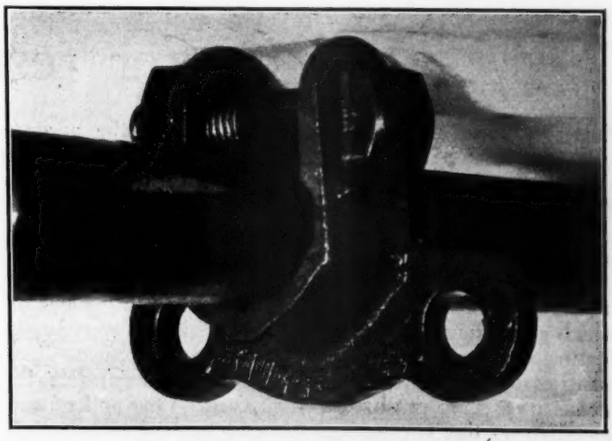


Angle cock holder designed to be used with any shape of steel bracket

and designed to fit old cars. The angle cock holder can be used with any shape of steel bracket which the construction of the car requires. No special keys or forgings are required, as an ordinary bolt effects the clamping.

Ample bearing surface on the bolts and clamps insures positive anchorage of the brake pipe and prevents vibration and longitudinal movement. The projecting lip on the angle cock holder fits over the "hex" on the angle cock, and prevents the latter from turning or becoming distorted.

The holes in the clamp, through which the bolt passes,



The Mudge forged steel pipe clamp

are elongated, so as to allow necessary movement of the bolt in the clamp. When the bolt is tightened up the two legs of the clamp are drawn in and, as this action takes place, the bolt is forced up against the pipe. A few turns of the nut cause the bolt to "bite" into the pipe, thereby effectively clamping the latter in position.

The bolt is practically self locking, because of the lug provided on one of the clamp legs and the angularity of the clamp legs when in the clamping position. Double nuts or lock nuts are not essential unless the standard practice of the railroad requires their use under all conditions.

Bullard driving box borer and facer

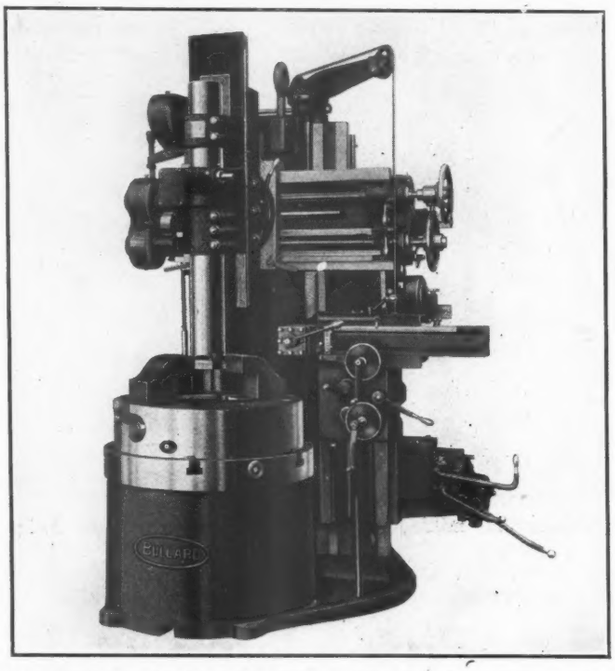
THE standard driving box borer and facer, manufactured by the Bullard Machine Tool Company, Bridgeport, Conn., has been redesigned to increase its adaptability to the various lengths of boxes. The tool support has also been strengthened to permit heavier cuts and greater accuracy.

In place of the "banjo type" main head and boring bar, the machine is provided with a cast steel main slide of extra length designed to clamp and support a heavy steel boring bar of sufficient length to accomodate boxes up to 23 in. The new design provides a heavier support for the bar and cutting tools and an adjustment in the bar extension from the main slide to suit the various lengths of boxes. For the shorter boxes, less extension is required, and, therefore, the cutting tools are supported closer to the point of cutting. This adjustment is readily made by a hand crank through a worm and gear to a rack in the bar. The clamping bolts to the main slide are then firmly secured and the vertical tool feed is obtained through the main slide. The various diameters of boxes are obtained by bringing the main head, bar and cutting tools close to the work by the cross traverse. The dimensions are read directly from the scale and micrometer dials. This avoids excessive overhang or extension of tools from the boring bar.

The machine is also equipped with a heavy two-jaw, self-centering chuck which securely holds the work on the opposed faces. It is also provided with a graduated micrometer cross adjustment for boring reliefs. The chuck is fitted for locating the box accurately on the vertical axis and for holding the cellar in place for boring.

Other standard features include a constant speed drive pulley with a multiple disc clutch and brake for starting and stopping the machine. All speed and feed changes are obtained by sliding gears within the machine itself. The standard Bullard features of centralized control, power rapid traverse for both vertical and cross movement of the main head and constant flow lubrication to all moving parts, are also included in the new design.

Direct reading scales and micrometer dials on the feed rods are of material assistance in gaging and duplicating sizes of work. Recently revised material specifications provide added strength in the driving train of shafts and gears and all other operating and supporting units subject to the strain of heavy cutting.

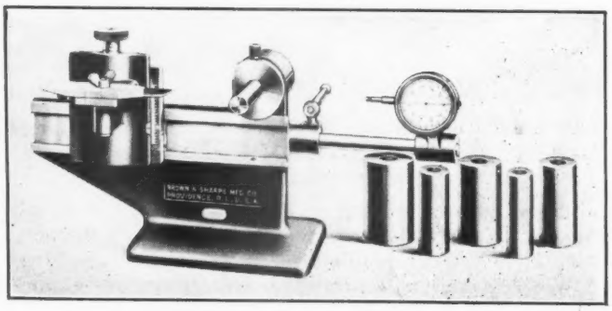


The Bullard driving box borer and facer with a capacity for boxes up to 23 in.

Cutter testing fixture

THE cutter testing fixture shown in the accompanying illustration and manufactured by the Brown & Sharpe Manufacturing Company, Providence, R. I., is used conveniently when sharpening gear or other formed cutters or hobs. All sizes of cutters up to 10 in. in diameter are within its capacity.

The testing plate is carried on a vertical slide which makes possible the testing of cutters the cutting faces of which are either radial or undercut. This is a convenient feature as it greatly broadens the use of the fixture. The position of the testing plate is indicated accurately by means of a scale graduated in 0.60 in. One end of the test plate is flat for testing straight gashed cutters and hobs, and the other end is made in the form of a knife-



A device for testing gear cutters or hobs

edge to permit the testing of spiral formed cutters or hobs having spiral gashes. The dial indicator may be furnished to read to thousandths of an inch English measure, or hundredths of a millimetric measure.

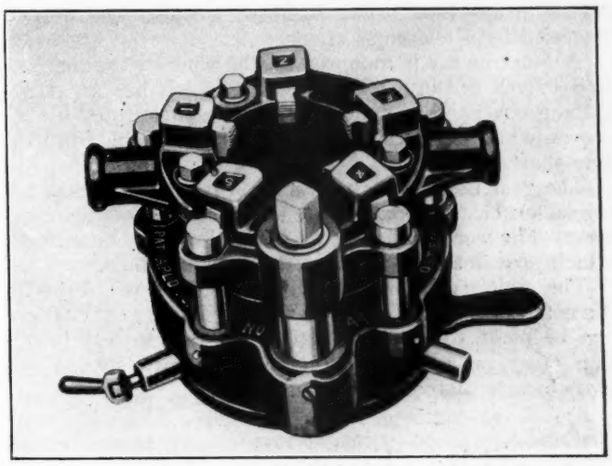
Five hardened and ground bushings are furnished in the following sizes: 7/8 in., 1 in., 1¼ in., 1½ in. and 1¾ in. diameter. A collar is also provided for use in testing thin cutters.

Die stock for large pipe sizes

AN easy cutting pipe threader for the larger sizes of pipe known as the No. 44 Receder has been placed on the market by the Oster Manufacturing Company, Cleveland, Ohio. The tool gets its easy cutting qualities from its narrow dies which are ground with an extra long lead and sharp rake. To further increase the ease of cutting, the tool is geared and is furnished with a ratchet handle so that one man can cut 4-in. pipe, which approaches the maximum size for a railroad shop, without hard work.

A massive leader screw protected by a patented chip shield starts the dies on the pipe and pulls them along, producing the proper pitch and taper. The leader screw, which is of great importance to a tool of this type, is kept free from dirt and chips by means of a shield.

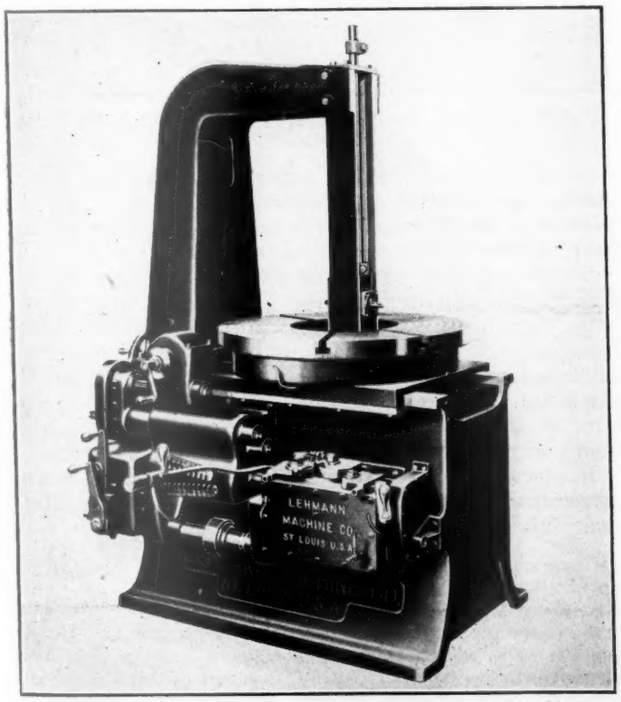
It is possible to cut over and undersize threads as well as to cut standard threads with this tool. A simple rotary movement of the die head adjusts the dies to cut either deep or shallow threads. A lever-operated, self-centering chuck takes the place of, and eliminates the bother of, changing pipe bushings for each size of pipe. The chuck insures a straight, true thread on all sizes from 2½ to 4 in., the range of the tool. The threading of short nipples is possible, as the bore of the stock is large enough to accommodate a 4-in. coupling.



The No. 44 receder which has a capacity for 2½-in. to 4-in. pipe, inclusive

Oil groove milling machine

A MACHINE designed primarily for railroad shop use to mill the oil grooves in driving box crown brasses has recently been placed on the market by the Lehmann Machine Company, Chouteau and Grand avenues, St. Louis, Mo. A head carrying a three-groove end mill of the desired size travels in the slides of the central vertical column. This column is rigidly secured at the bottom and is fastened at the top to the heavy main column which bridges over from the back of the machine, forming a structure sufficiently rigid to withstand the requirements of the maximum demands.



This machine cuts oil grooves in driving box crown brasses

The table is provided with a device for holding the brasses in position and means are provided for easily determining the correct location. The table has a lateral movement so that the brass may be fed against the cutter to produce a groove of the desired depth. The table has a rotary movement which co-ordinates with the vertical movement to cut the diagonal grooves. A feed box with 40 quick changes of feed controls the rotary movement of table, and this is provided with an index indicating the length of straight grooves to which the diagonal grooves are formed. The operator has only to select the length of the straight grooves and drop the plunger of the quick change into the hole which designates this dimension.

The control for the operation is by one handle which, in a central position, gives a straight vertical movement to the head, when moved to the left gives a left diagonal movement, again to the center a vertical movement, and to the right a right diagonal movement, completing the operation with four movements of a single handle. Neutral positions are provided between all the feed positions of this handle.

Steps for both the upper and lower position of the cutter are provided with a graduated index. These are

set, before the operation, for the length of the slot desired, which relieves the operator from the necessity of throwing the control handle at precisely the right time. The feed of the cutter comes to a stop at the extremity of its movements until the control handle is thrown to its succeeding operating position.

The various movements have handles for manual operation or independent power movement for obtaining the setting up positions.

Provision is made for the disposal of chips to the inside of the machine base, which has an opening through which they may be removed. All working parts are protected from chips. The feed screw under the head is enclosed by a telescopic cover.

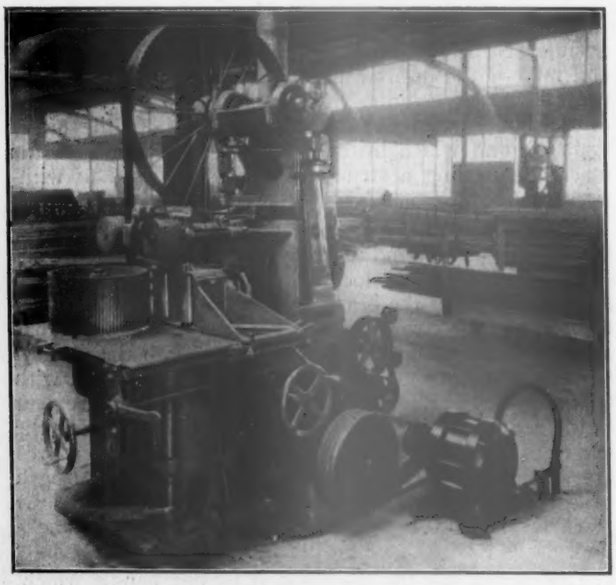
A 5-hp. motor is mounted on the back of the machine and drives through a silent chain which has an oil-retaining cover. A countershaft may be substituted for the motor when it is desired to drive the machine from the line shaft.

The gear boxes are closed and oil retaining, except for the quick change box, which has a central oiling reservoir. The worm and gear on the table run in an oil bath which provides lubrication to the table bearings.

The capacity of the machine is from 7 in. to 14 in. diameter and up to 22 in. in length. Simple gear changes can be made to modify relative feed movements to obtain other oil groove arrangements. Two speeds and two changes of feed are provided.

The Texrope drive

THE Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has recently perfected a new type of short center, flexible drive, known as the Texrope drive. It consists of two grooved sheaves and a number of specially constructed endless V-belts. The



A 15 hp., 1,750 r.p.m. roller bearing motor driving a 550 r.p.m. band resaw through a Texrope drive

sheaves are set just far enough apart so that the belts fit the grooves without either tension or slack. Because of the V-construction, the belts cannot slip, as the harder the pull the more firmly the belts grip the grooves. Being elastic, they cannot jerk either in starting, accelerating or running, nor can they transmit vibrations, but act as cushions between the driving and driven machines.

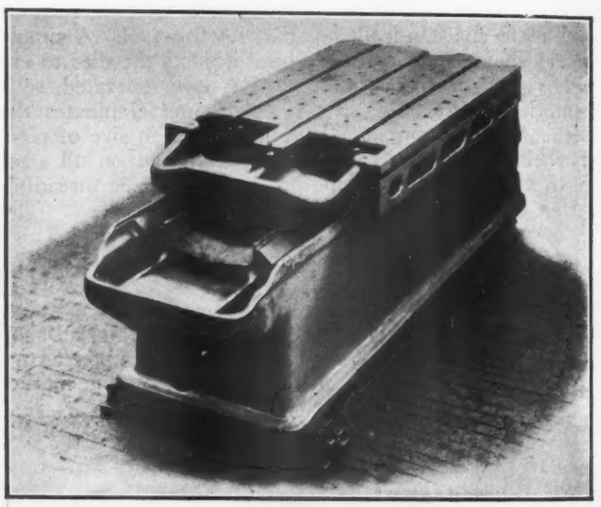
Since no belt tension is employed, the bearing pressures are low. The drive occupies very little space and it is claimed that the drive is unaffected by moisture or dirt. Since there is no slip, the speed ratios are fixed and exact.

Texrope drivers from ½ to 250 hp., with ratios up to 7 to 1 and belt speeds from 800 to 6,000 ft. have already been placed in service.

Inner guide box table for Hypro planers

THE planer tables in general use allow chips to fall off the ends of the table into the vees of the bed, especially so when planing near the end of the table. Sometimes this causes considerable damage through chips getting between the bed and table and cutting either one or the other or both. This results in destroying the accuracy of the planer, as well as the looks.

The only way for the operator to avoid this is to stick up a cardboard or fasten a tin or sheet iron cover to the



A pocket is cast integral with the table to catch the chips

end of the table. This is soon bumped out of shape, making an unsightly appearance. It also destroys the joint when the pan or guard is bolted to the table. These bolts usually work loose and allow the guard to rattle.

The new pocket on the end of the table of the Hypro planers, manufactured by the Cincinnati Planer Company, Cincinnati, Ohio, is cast integral with the table, heavy enough to stand rough usage and large enough to catch and carry all the chips that will come off the end of the table. This addition to the design makes a one-piece table of solid construction and neat appearance in harmony with the construction on the end of the bed.

In case the work is extremely high and must be blocked on the end pockets the walls can be used as stops, thus really giving more capacity to the machine.

AUTOMATIC PUMPING.—"Automatic Pumping" is the title of a new 24-page booklet issued by Barrett, Haentjens & Co., Hazelton, Pa. This edition differs from previous bulletins describing the automatic operation of centrifugal pumps in that the subject is treated from a purely technical standpoint and several new methods of making centrifugal pumps automatic are described.

News of the Month

The Denver & Rio Grande Western has opened an apprentice school at its shops at Alamosa, Colorado, in which pupils are to be instructed in general car and locomotive repair work.

Sir W. G. Armstrong, Whitworth & Co., Ltd., Newcastle-on-Tyne, have been awarded a contract for the building of 25 heavy freight locomotives and tenders for the Queensland Government Railways. These locomotives, which will be built at the Scotswood Works, Newcastle-on-Tyne, will be shipped to Brisbane fully erected and in running order in accordance with this builder's usual practice.

The safety program of the A. R. A. for the month of September has been issued (circular No. 132) by L. G. Bentley, chairman of the Committee on Education; it embodies those items of the I. C. C. record which cover fatal and non-fatal injuries under the head of (a) collapses, falls of objects, etc., and (b) coupling or uncoupling locomotives, cars, safety chains and hose. While in a sense these are minor items of Tables 71, 72 and 90, the committee believes that no item yet covered by the twelve-months' program will more readily respond to supervision. The slipping or failure of makeshift scaffolds is prominent in the list of causes under the first mentioned class. Second only to the superior authority and influence of the foreman, the trained safety inspector and a strong plant safety committee are of the greatest value in keeping this record low. In coupling and uncoupling, the neglect of men to have a complete understanding of conditions with all of their associates on a given piece of work, is one of the principal causes of failure. It is the duty of trainmasters and yardmasters to see that violations of prescribed precautions are properly punished. Employees who indulge in unsafe practices should be penalized even though no accident occurs.

Continuous train control demonstration on the Michigan Central

On July 13, a demonstration of the continuous type of automatic train control (Clark patents) as manufactured by the Continuous Train Control Corporation, New York, was made on the Michigan Central near Rives Junction, Mich. This test, on a 4,000 ft. track section, with one locomotive, is said to have demonstrated the practicability of the principle of the system, which includes a so-called radio feature. An oscillator delivers a high frequency energy to the rails when the signal is at clear and a different frequency when the signal is at caution, while no energy is delivered when the signal is at stop. The current is picked up by receiver coils on the engine, in a manner somewhat similar to other continuous systems.

Wage increases of approximately one and one-half cents an hour have been granted by the Chicago & Alton to certain of its shopmen, agents and telegraph operators to bring their rates up to a level with those of employees of similar classifications on other roads in the middle west.

Apprentices on Swiss railways have psychological tests

The Swiss Federal Railways, according to the Federal Railways Bulletin, have made psychological tests, as well as other examinations of general knowledge, a prerequisite to acceptance for apprenticeship in the various shop trades.

The general knowledge examination consists of requiring the applicants to reproduce as closely as possible the essential features of a short essay which is read to them; to solve several practical problems and to write an essay on one of several subjects given them to choose from. Papers are graded according to the ideas which are expressed in them, the order in which these ideas are expressed and spelling.

Applicants take the general knowledge examination in groups. Those who pass it satisfactorily are admitted to the psychological examination, which they take as individuals. This examination is designed to test their aptitude for the trade which they wish to learn. It includes a test for the memory of figures, the accuracy of perception, the ability to reason practically from a technical standpoint, the sensibility of muscles of the arm and hand to control the actions of those members, dexterity, and accuracy of a visual estimate. Special texts and apparatus are used for this examination and the conditions are the same for all candidates. This examination not only permits the examiner to learn the practical abilities of the young man, but also to penetrate his personality.

After these two examinations a choice to fill vacancies is made from the most apt, who are then given a physical examination which, if passed, admits them to full apprenticeship. Experience in the shop of these young men during the probationary period has borne out the efficacy of these tests in admitting only those suited to the work. A group so admitted to the Olten shops in the spring of 1925 after six months were graded as follows: 29 per cent, "very good"; 47 per cent, "good"; 24 per cent, "fairly good." Not one of the young men received the lowest passing mark which is "satisfactory."

New equipment

Class I railroads during the first five months this year installed in service 933 locomotives, according to reports compiled by the Car Service Division of the American Railway Association. This was an increase of 185 over the number installed during the corresponding period last year and an increase of 22 over the corresponding period in 1924. It was, however, a decrease of 764 compared with the corresponding period in 1923.

Locomotives on order on June 1 this year totaled 612, compared with 329 on the same date last year and 447 on the same date in 1924. On June 1, 1923, however, 2,041 locomotives were on order.

During the first five months the railroads also placed in service 42,300 freight cars, of which 10,320 were installed during May. Of the total 20,673 were box cars, 16,628 were coal cars and 2,666 were refrigerator cars.

The total number installed from January 1 to May 31 this year, was a decrease, however, of 28,649 as compared with the number placed in service during the corresponding period last year and a decrease of 16,255 under the number placed in service in 1924.

The railroads on June 1 this year had 44,628 freight cars on order, an increase of 8,113 over the number on order on the same date last year but a decrease of 16,628 under the number on order on June 1, 1924.

These figures as to freight cars and locomotives include new and leased equipment.

New construction

CHICAGO & EASTERN ILLINOIS.—A contract has been awarded to G. A. Johnson & Son, Chicago, for the construction of an engine terminal at Evansville, Ind.

NORFOLK & WESTERN.—This company has awarded a contract to J. P. Pettyjohn & Co., Lynchburg, Va., for the construction

of a roundhouse and machine shop at Williamson, W. Va., to cost approximately $115,000.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—A contract has been awarded to T. & L. B. Libby, Minneapolis, Minn., for the construction of an addition to the enginehouse at St. James, Minn., at an estimated cost of $50,000.

MISSOURI PACIFIC.—A repair shop will be constructed at Hot Springs, Ark., and other improvements will be made at this point including the construction of two heating plants, two train sheds long enough to accommodate trains of 18 and 19 cars, a 50,000-gal. water tank and the installation of a large cinder conveyor. The passenger station will be remodeled also. The improvements at Hot Springs are expected to cost approximately $200,000.

MAINE CENTRAL.—This company has authorized the installation of a new wheel shop, blacksmith shop and passenger car repair track at Rigby, Me., and the transfer of machinery and tools to that place from Thompson's Point, Me. The project will cost approximately $72,000. It has also authorized the replacement of the old wheel shop and wash room building by a new shop, and the installation of new and second-hand machinery and a new transfer table at Waterville, Me., to cost approximately $83,000.

Master Blacksmiths Supply Men's Asociation elect officers for 1927

A total of 16 railway supply companies were represented at the thirtieth annual convention of the International Railroad Master Blacksmiths' Association held August 17, 18 and 19, 1926, at Hotel Winton, Cleveland, Ohio. The annual meeting of the Supply Men's Association was held on the last day of the convention at which time the following officers were elected to serve for the ensuing year: President, A. N. Lucas, Oxweld Railway Service Company; vice-president, C. D. Harmon, National Machinery Company; secretary-treasurer, W. R. Walsh, Ewald Iron Company. The following is a list of the exhibitors and representatives:

Acme Machinery Company, Cleveland, Ohio—Literature on bolt and forging machines. Represented by C. R. Davis, H. M. Anderson and C. E. Smith.

Ajax Manufacturing Company, Euclid, Ohio—Model of Ajax forging machine, forgings and literature. Represented by J. R. Blakeslee, W. W. Criley, G. G. Fristoe, A. L. Guilford, H. D. Heman and J. A. Murray.

Anti-Borax Compound Company, Fort Wayne, Ind.—Welding compounds and literature. Represented by C. O. Kahre.

Colonial Steel Company, Pittsburgh, Pa.—Literature on alloy and carbon tool steels. Represented by C. Carnahan, E. W. Thurber.

Crucible Steel Company of America, Pittsburgh, Pa.—Literature on dies, taps and high speed and special tool steel. Represented by F. Baskerfield, P. J. Connor, A. E. Jones and W. M. Stevenson.

DeRemer Blatchford Company, Chicago—Represented by C. P. Nye and G. P. White.

Ewald Iron Company, Louisville, Ky.—Represented by R. F. Kilpatrick, W. R. Walsh.

Firth Sterling Steel Company, McKeesport, Pa.—Literature on bolt and rivet dies. Represented by W. C. Royce, C. E. Hughes, Alan Jackman, E. T. Jackman, T. A. Larecy and W. A. Nungester.

Heppenstahl Forge & Knife Company, Pittsburgh, Pa.

Houghton, E. F. and Company, Philadelphia, Pa.—Railway springs, quenching oils, "drawtemp" literature. Represented by C. W. Nohl.

Metal & Thermit Corporation, New York—Specimens of thermit welding, literature. Represented by E. W. Bloom and H. D. Kelley.

National Machinery Company, Tiffin, Ohio—Specimens of machine forging work, literature. Represented by K. L. Ernest, C. D. Harman and H. E. Lott.

Oxweld Railway Service Company, Chicago—Oxy-acetylene welding equipment, literature. Represented by A. N. Lucas, C. E. Allen, G. M. Crownover, R. R. Kester, W. R. Montgomery and G. V. Rainey.

Pilot Pack Company, Chicago—Packing, literature. Represented by W. W. Bacon and J. Sinkler.

Railway Journal, Chicago—Copies of publication. Represented by E. C. Cook.

Railway Mechanical Engineer, New York—Copies of publication and books. Represented by H. C. Wilcox.

Rockwell, W. S. Company, New York—Oil and gas burners, forging and heat treating furnaces, literature.

Vanadium Alloys Steel Company—Literature on alloy steels. Represented by R. R. Artz.

Meetings and Conventions

National Machine Tool Builders' expositon

The National Machine Tool Builders' Association will hold, September 19 to 24 inclusive, in the Public Hall, Cleveland, Ohio, its first exposition of machine tools, or machinery, equipment, supplies, accessories, material, services, or other articles, methods or processes essential or incidental to the industrial utilization of modern machine tools. A basic feature of the exposition will be the exclusion of the general public—of all persons not having a reasonably direct interest in machine tools and their accessories. By commercial, industrial or technical registration, identification only any interested persons may obtain admission. Therefore, the exposition will be a concentration for the serious purpose of inspection and buying of machine tool users.

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs.

AIR-BRAKE ASSOCIATION.—F. M. Nellis, Room 3014, 165 Broadway, New York City.

AMERICAN RAILROAD MASTER TINNERS' COPPERSMITHS' AND PIPEFITTERS' ASSOCIATION.—C. Borcherdt, 202 North Hamlin Ave., Chicago.

AMERICAN RAILWAY ASSOCIATION, DIVISION V.—MECHANICAL.—V. R. Hawthorne, 431 South Dearborn St., Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago. Next meeting September 14-16, Book-Cadillac Hotel, Detroit, Mich.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey St., New York.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet Ave., Chicago. Annual convention September 1-3, Hotel Sherman, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth St., New York. Railroad Division, Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church St., New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 4600 Prospect Ave., Cleveland, Ohio. Annual convention September 20-24, Municipal Pier, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill. Annual meeting October 27-30, Chicago.

BIRMINGHAM CAR FOREMEN AND CAR INSPECTORS' ASSOCIATION.—P. H. Gillean, 715 South Eightieth Place, Birmingham, Ala. Meeting second Monday in each month at Birmingham Y. M. C. A. Building.

CANADIAN RAILWAY CLUB.—C. R. Crook, 129 Charron St., Montreal, Que. Regular meetings second Tuesday in each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 626 N. Pine Ave., Chicago, Ill. Meeting second Monday in month, except June, July and August, Great Northern Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—R. E. Giger, 721 North 23rd St., E. St. Louis, Ill. Meetings, first Tuesday in month, except June, July and August, at the American Hotel Annex, St. Louis.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 514 East Eighth St., Los Angeles, Cal. Meeting second Friday of each month in the Pacific Electric Club Building, Los Angeles, Cal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 26 Cortlandt St., New York, N. Y. Regular meetings, second Thursday each month, except June, July and August. Hotel Statler, Buffalo, N. Y.

CHIEF INTERCHANGE CAR INSPECTORS' AND CAR FOREMEN'S ASSOCIATION.—A. S. Sternberg, Belt Railway. Clearing Station, Chicago. Convention September 21, 22 and 23. Hotel Sherman, Chicago.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 811 Union Central Building, Cincinnati, Ohio. Meetings, second Tuesday, February, May, September and November.

CLEVELAND STEAM RAILWAY CLUB.—F. L. Frericks, 14416 Adler Ave., Cleveland, Ohio. Meetings first Monday each month except July, August and September, at Hotel Hollenden, East Sixth and Superior Ave., Cleveland, Ohio.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark Ave., Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—J. B. Hutchinson, 1809 Capital Ave., Omaha, Neb.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash Ave., Winona, Minn. Annual convention September 7-10, Hotel Sherman, Chicago.

MASTER BOILERMAKERS' ASSOCIATION.—Harry D. Vought, 26 Cortlandt St., New York.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting second Tuesday in month, except June, July, August and September. Copley-Plaza Hotel, Boston, Mass.

NEW YORK RAILROAD CLUB.—H. D. Vought, 26 Cortlandt St., New York. Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth St., New York.

PACIFIC RAILWAY CLUB.—W. S. Wollner, 64 Pine St., San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY CLUB OF GREENVILLE.—F. D. Castor, clerk, maintenance of way department, Bessemer & Lake Erie, Greenville, Pa. Meeting last Friday of each month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August. Fort Pitt Hotel, Pittsburgh, Pa.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

SOUTHEASTERN CARMEN'S INTERCHANGE ASSOCIATION.—J. E. Rubley, Southern Railway Shops, Atlanta, Ga.

TEXAS CAR FOREMEN'S ASSOCIATION.—A. I. Parish, 106 West Front St., Fort Worth, Tex. Regular meetings, first Tuesday in each month. Terminal Hotel Bldg., Fort Worth, Tex.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth St., Cleveland, Ohio. Annual meeting September 14-17, Hotel Sherman, Chicago.

WESTERN RAILWAY CLUB.—Bruce V. Crandall, 189 W. Madison St., Chicago. Regular meetings, third Monday in each month, except June, July and August.

Supply Trade Notes

The American Steel Foundries has moved its St. Louis office from the Frisco building to the Railway Exchange building.

The Timken Roller Bearing Company will construct an extension to its plant at Canton, Ohio, estimated to cost $1,000,000.

Thorsten E. Dahlberg, one of the founders of the Celotex Company and assistant to the president until 1924, died at El Paso, Texas, on July 27.

The Oakley Chemical Company, 22 Thames street, New York, has changed its name to Oakite Products, Inc. The personnel of the company remains the same.

The Reading Iron Company, Reading, Pa., has opened an office at 721 Pioneer Trust building, Kansas City, Mo., and will be directly represented by O. R. Lane.

V. V. Casey will represent the Bonney Forge & Tool Works, Allentown, Pa., in Pennsylvania, southern New York, Maryland, District of Columbia and New Jersey.

The Locomotive Firebox Company, Chicago, has opened an office at 30 East Forty-second street, New York, in charge of George N. De Guire, assistant to the president.

The Bridgeport Brass Company has removed its New York City office from the Pershing Square building to the Farmers' Loan & Trust Company building, 475 Fifth avenue.

H. G. Steinbrenner has been elected second vice-president of the Brown Hoisting Machinery Company, Cleveland, Ohio, and will have charge of the marketing of the company's products.

Charles F. Palmer has been appointed manager of sales of the Pittsburgh Steel Products Company, Pittsburgh, Pa. C. H. Van Allen has been appointed manager of the Chicago office to succeed Mr. Palmer.

F. A. Whitten, formerly chief engineer of the General Motors Truck Company, Detroit, Mich., has been appointed engineer in charge of design and development of the American Car & Foundry Motors Company, Detroit.

R. F. Stubblebine, railway sales engineer of the Hale-Kilburn Company, Philadelphia, Pa., has been appointed eastern sales manager with headquarters at 30 Church street, New York, succeeding A. F. Old, deceased.

C. R. Ahrens, formerly eastern sales representative of the Chicago Railway Signal & Supply Company, has been appointed eastern sales representative of the Illinois Iron & Bolt Company, with headquarters at 30 Church street, New York.

L. N. Ridenour has been appointed special factory representative of the Harnischfeger Corporation, Milwaukee, Wis., and E. L. Puckett, Richmond, Va., has been appointed district manager of the Harnischfeger Corporation's Charlotte, N. C., office.

Robert I. Fretz, for the past year in charge of boiler tube sales of the Reading Iron Company, Reading, Pa., has been appointed district sales manager of pipe sales in the Reading district which embraces New York state, excluding New York City and eastern Pennsylvania, excluding Philadelphia. Mr. Fretz succeeds R. L. M. Taylor, who has resigned.

The Ohio Brass Company is now manufacturing its regular and special types of its gas-weld signal bonds with either steel or copper terminals. Heretofore the bonds have been made only with steel terminals but changing conditions have created a new set of requirements and the copper terminals are added to complete the line of signal bonds.

H. H. Pleasance, vice-president and sales manager of the United Alloy Steel Corporation, Canton, Ohio, has resigned that position to become affiliated with the Bourne-Fuller Company, and George H. Charls, president, has resigned following the merger of the United Alloy Steel Corporation with which he was connected, with the Central Alloy Steel Corporation.

Arthur H. Weston has been appointed representative of the Clark Car Company, with headquarters in the American National Bank building, Richmond, Va. He will handle the company's business in the states of Maryland, Virginia, North Carolina and South Carolina. Mr. Weston was formerly, for many years, sales engineer for the Symington Company, and more recently vice-president of the Car Devices Company.

Frans H. C. Coppus has resigned as president and treasurer of the Coppus Engineering Corporation, Worcester, Mass., in order to devote most of his time to railway equipment under the firm name of Coppus Locomotive Equipment Company, Worcester, Mass. The Coppus Engineering Corporation has assigned to Mr. Coppus its rights and interests pertaining to this line. Mr. Coppus will be identified with the Coppus Engineering Corporation in a consulting capacity and as chairman of the board, retaining also his financial interest in the corporation. Otto Wechsberg, formerly general manager, is now president and general manager, and Jerome R. George, Jr., is treasurer of the Coppus Engineering Corporation.

The Keith Car & Manufacturing Company, Sagamore, Mass., has acquired a majority of the common stock of the Standard Tank Car Company, of Sharon, Pa. The directors of the company are: W. J. McKee, vice-president of the Keith Car & Manufacturing Company; Ebon S. Keith, president of the Keith Car & Manufacturing Company; William M. Robinson and John G. Frazer of the firm of Reed, Smith, Shaw & McClay, Pittsburgh, Pa.; E. A. MacDonald, treasurer of the Standard Tank Car Company; H. C. Rorick of Spitzer, Rorick & Co., Toledo, Ohio, and H. E. Coyl, vice-president of the Standard Transit Company. The officers of the company are: W. J. McKee, president; E. A. MacDonald, secretary and treasurer and J. W. Keefe, auditor. The principal executive office will remain at Sharon, Pa. The Standard Tank Car Company owns the capital stock of the Standard Transit Company, whose directors are the same as those of the Standard Tank Car Company and the officers are the same with the addition of H. E. Coyl, vice-president.

Joseph Robinson, Inc., has been organized to own and manage all United States and foreign patent rights for the Robinson automatic air and steam hose connector, a $1,200,000 development. Mr. Robinson, who previously owned these rights individually, has transferred them all to the company. The capitalization of the company is 1,500 no par value cumulative preferred shares, and 25,000 no par value common shares. The officers are: Joseph Robinson, president; G. E. Matheson, vice-president; J. H. Rogers, secretary and treasurer. The directors are: J. H. Rogers, president, British American Trading Corporation; R. M. Wolvin, president, British Empire Steel Corporation; E. W. Poindexter; L. J. Howarth, treasurer, Liberty Trust Company, and Joseph Robinson. The company's patent rights will be worked under license to an operating company, plans for which are progressing. The office of the company is in New York. At a recent meeting of the board of directors, Joseph Robinson, inventor of the Robinson automatic connector, was elected president of the Joseph Robinson, Inc. Mr. Robinson was born at Dayton, Wash., on July 21, 1889, and was educated in the common schools. He began his engineering career as a blacksmith, going through machine shop and foundry practice to the drafting board, and from there into research and development engineering. While his engineering developments are extensive, Mr. Robinson is best known for his invention and development of the Robinson automatic air and steam hose connector.

Joseph Robinson

LaMonte Judson Belnap, has been elected president of the Worthington Pump & Machinery Corporation, New York, and C. Philip Coleman, retiring president, has been elected chairman of the board. Mr. Belnap was born at Burr Oak, Mich., on November 7, 1877. He was educated in the public schools of Lincoln, Neb., and afterwards attended the University of Nebraska, from which he was graduated in 1898 with the degree of B. S. in E. E. During his college course he was employed for four years during the summer vacations on survey and construction work on the Chicago, Burlington & Quincy, in Montana and Wyoming, and soon after graduation, entered the employ of the Western Electric Company, at Chicago, as a student apprentice. He later became associated in various technical, sales and managerial capacities with the Wagner Electric Manufacturing Company, St. Louis, the Bullock Electric Manufacturing Company, at Cincinnati, and the Allis-Chalmers Company at Milwaukee and Montreal. In 1911, Mr. Belnap left the Allis-Chalmers Company and became vice-president of the Rudel-Belnap Machinery Corporation, Ltd., Montreal, retaining his interest in this company until 1925. Simultaneously with his work in the Rudel-Belnap Company, he organized in 1914 the Ingersoll Machine Company, Ltd., of Canada, of which company he was president until 1920; also, from 1917 to 1919 he was managing director of the Williams Manufacturing Company, Ltd., of Montreal, and from 1919 to 1925, was president of the Rolls-Royce Company of America at Springfield, Mass. In 1925 and 1926 he was chairman of the board of the Wills Sainte Claire Company, of Marysville, Mich. When the United States entered the war the British War Mission in Washington was organized and Mr. Belnap served as its assistant director, and in addition to his duties there he was actively engaged at the same time on war orders with the Williams Manufacturing Company, Ltd., at Montreal.

L. J. Belnap

The Pyrotung Manufacturing Company has recently been organized and a new plant built at 730 W. 50th St., Chicago, for the manufacture of railroad track drills and shop cutting tools. These tools are made by the new Pyrotung process, designed to give unusual toughness and hardness without brittleness. The officers of the new company are: W. R. Otis, president; C. E. Sutten, vice-president; B. C. Cleveland, vice-president and metallurgical engineer; and C. E. Pynchon, general manager, who was formerly manager of the machinery and tools departments of J. T. Ryerson & Son., Inc.

Charles A. Coffin

Charles A. Coffin, founder and for 30 years head of the General Electric Company, Schenectady, N. Y., as president and chairman of the board of directors, died on July 14 at his home in Locust Valley, Long Island, N. Y. Up to within two weeks of his death Mr. Coffin had been regularly to his office in New York and continued his active interest in the progress of the electrical industry and more particularly the General Electric Company, of which he was a director.

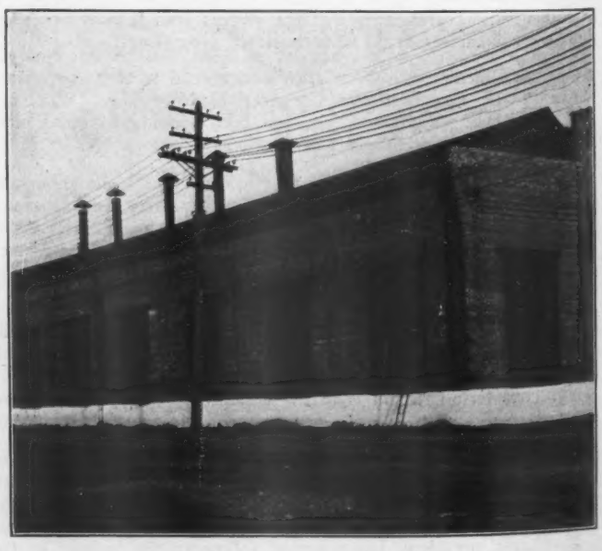
Charles Albert Coffin was for 30 years the financial and commercial genius of the General Electric Company. Prior to the formation of that company, in 1892, he was with the Thomson-Houston Electric Company, one of the predecessors of General Electric. Mr. Coffin was born in December, 1844, in Somerset county, Maine, and graduated from Bloomfield (Me.) Academy. He went to Boston as a young man and became interested in the shoe and leather industry. Mr. Coffin, with Micajah P. Clough, formed the firm of Coffin & Clough, and established a factory at Lynn, Mass., one of the largest shoe manufacturing centers in New England.

In 1883 Mr. Coffin became interested in the purchase of the American Electric Company of New Britain, Conn., a small concern, the head of which was Professor Elihu Thomson. The business was moved to Lynn and the name changed to the Thomson-Houston Electric Company in honor of Professor Thomson and his early associate, Professor Edwin J. Houston. Mr. Coffin became its vice-president and treasurer, and through his leadership the company developed the central station idea as applied to arc lighting. In 1888, he induced the company to enter the electric railway field, manufacturing equipment for electric street car lines in many parts of the country. A number of other electrical concerns were absorbed, and in 1892 the Thomson-Houston Company was consolidated with the Edison General Electric Company of New York under the name of General Electric Company. Mr. Coffin was immediately elected president, and directed its affairs for the succeeding twenty-one years.

During the electrical development of the late nineties and early years of the new century, he continued to exercise strong and inspiring leadership. He supported the work of his company's engineers in developing the Curtis steam turbine, which revolutionized the primary power sources in electric light and power stations, and he endorsed the movement to establish, in 1901 a laboratory for electro-chemical research which grew to be the research laboratory of today.

Mr. Coffin retired from the presidency of the company in 1913, but became chairman of the board of directors, remaining in active participation in the company's affairs until 1922. In 1915 he was engaged in organizing the War Relief Clearing House for France and her allies. This was later consolidated with the American Red Cross in which Mr. Coffin was active throughout the World War.

He was a director in the General Electric Company, the International General Electric Company, the British Thomson-Houston Company, the Companie Francaise pour l'Exploration des Procedes Thomson-Houston, the Electric Bond & Share Company, the Electrical Securities Corporation, the American International Corporation, the Illuminating & Power Securities Corporation and the Union Carbide & Carbon Corporation. He was an officer of the Legion of Honor, of France; a commander at one time of the Order of Leopold II, of Belgium; a member of the Order of Saint Sara, of Servia, and had served as a vice-president of the Chamber of Commerce of New York and a member of the Merchants' Association of New York. Mr. Coffin was made an honorary member of the Franklin Institute of Philadelphia, in 1924.



Blacksmith shop located at the North Billerica shops of the Boston & Maine, showing the effects of the use of whitewash

Trade Publications

VALVES.—The O-B lines of valves are pictured in a folder which has just been issued by the Ohio Brass Company, Mansfield, Ohio.

GAS COMPRESSORS.—Bulletin No. 83-C descriptive of Sullivan belt-driven single and two-stage gas compressors has been issued by the Sullivan Machinery Company, 122 S. Michigan avenue, Chicago.

AIR FILTER.—The Phoenix automatic constant-effect air filter is illustrated and described in a bulletin issued by the Drying Systems, Inc., 1800 Foster avenue, Chicago. This equipment is electrically operated.

EXPANSION REAMER.—The No. 717 spiral flute expansion reamer is fully described and illustrated in a four-page circular being distributed by the Morse Twist Drill & Machine Company, New Bedford, Mass.

WHITING PRODUCTS.—A broadside on its electric drop pit table, showing results obtained in actual use, has been issued by the Whiting Corporation, Harvey, Ill. The standard building clearances for Whiting overhead electric traveling cranes are given in Bulletin No. 176.

RIGIDMIL.—The detail construction and operation of the Rockford Rigidmil is described in a 30-page, illustrated catalogue which has been issued by the Rockford Milling Machine Company, Rockford, Ill. The Rockford rotary Rigidmil and vertical attachment is also described.

MACHINE TOOLS.—Four circulars descriptive of the construction and operation of the Niles 90-in. quartering machine, the Niles car wheel borer, the Niles 90-in. journal turning lathe and Time-Saver planers, respectively, have been issued by the Niles Tool Works Company, Hamilton, Ohio.

GRINDERS.—Twenty-six to 38-in., Styles E and F grinders, suitable for planer or other knives designed especially for mills, factories or shops employing knives or small circular rip saws in a limited way, are described in a four-page folder which has been issued by the Machinery Company of America, Big Rapids, Mich.

THE SPINDLE BOOK.—The second edition of "The Spindle Book" has just been issued by the Jacobs Manufacturing Company, Hartford, Conn. This booklet contains 95 pages, illustrating and giving the principal dimensions, manufacturers' names and information concerning equipment upon which drill chucks are used.

CONOIDAL FANS.—The Buffalo Forge Company, Buffalo, N. Y., has issued catalogue No. 475 describing in detail the construction of its series of Baby conoidal fans which are built in sizes delivering from 78 to 6,850 cu. ft. per min. The Buffalo Type FB variable and constant speed electric blowers are described in a four-page bulletin, Form No. 2386.

HOISTING AND HAULING.—A 16 page booklet entitled "Handy hoisting and hauling," has been issued by the Sullivan Machinery Company, 122 South Michigan avenue, Chicago. The service rendered by the Sullivan Turbinair steam and electric portable hoists is described in this booklet which shows many of the uses to which these hoists have been adapted.

NICKEL STEEL.—Bulletin No. 6, giving comparative costs of producing commercial forgings with carbon steel and nickel steel die blocks and the savings effected by the use of the latter material, has been issued by the International Nickel Company, 67 Wall street, New York. Bulletin No. 7 is descriptive of automobile design and automotive steels.

GAGES.—The installation and details of construction of a new line of pointer gages for draft, pressure and differentials are described in the catalogue which has just been issued by the Hays Corporation, Michigan City, Ind. These gages are provided with large illuminated scales having uniform divisions and heavy black figures, and can be read at a distance from 50 to 100 ft.

WELDING AND CUTTING APPARATUS.—The Purox Company, Denver, Colo., has issued catalogue No. 6 descriptive of its apparatus for welding and cutting metals. The oxygen-acetylene welding process is briefly described, also the points and principles used in the design and construction of the Purox equipment. An apparatus and supplies price list accompanies this catalogue.

TURRET LATHES.—The Jones & Lamson Machine Company, Springfield, Vt., has issued a two-page leaflet announcing a new size Hartness flat turret lathe known as the 4 in. by 34 in. The machine is a development of the 3 in. by 36 in. turret lathe. It has added size capacity and such additional pulling power, weight and rigidity as are desirable for the larger work to be turned.

ELECTRIC LOCOMOTIVES.—Circular No. 400, giving a survey of the most important improvements which have been realized with electric locomotives equipped with the new Brown-Boveri individual axle drive, has been issued by the American Brown-Boveri Electric Corporation, 165 Broadway, New York. Cross-sectional drawings show the leading dimensions and axle pressures of the 2D2 locomotives for the Paris-Orleans Railway.

ELECTRICAL PROGRESS.—"Industry's Electrical Progress" is the title of Publication No. C-37 which has recently been issued by the Cutler-Hammer Mfg. Co., 1266 St. Paul avenue, Milwaukee, Wis. A number of examples of production economies obtained through the use of the C-H controller in various industries are outlined in this publication, also the duty of motor controllers and the problems to be considered when ordering motor-driven equipment.

MALLEABLE IRON.—The American Malleable Castings Association, Union Trust building, Cleveland, Ohio, has issued a 30-page booklet clearly explaining the origin, development, valuable properties, method of manufacture and uses of certified malleable iron. It has been prepared particularly for the executive interested in costs and profits; the engineer designer interested in efficiency and performance, and the student interested in the many forms of iron and its uses.

WHITING PRODUCTS.—A condensed catalogue of equipment manufactured by the Whiting Corporation and its subsidiaries for use in foundries, steel plants, power stations, railroad shops, chemical works and other industries, has been issued by the Whiting Corporation, Harvey, Ill. The catalogue (No. 175) is attractively arranged and contains many photographs showing the standard line of Whiting cranes and foundry equipment in operation, also the various specialties and products of the Whiting subsidaries.

VERTICAL ENGINES.—Bulletins No. 302B, 601 and 801 have been issued by Engberg's Electric & Mechanical Works, St. Joseph, Mich. Horsepower tables for vertical enclosed self-oiling engines are given in Bulletin No. 302B, which is a supplement to Bulletin No. 302 in which the Engberg engines are fully described and illustrated. Direct and alternating current generators and their application to internal combustion engines are fully described and illustrated in Bulletin No. 601. Bulletin No. 801 covers Engberg alternating current, direct-connected generating sets.

WROUGHT STEEL WHEELS.—The contours of two designs of light-weight wrought steel wheels for use under light-wheel freight cars are shown in a booklet being issued by the Carnegie Steel Company, Pittsburgh, Pa. These light-weight wheels are forged and rolled under the same conditions and by the same methods obtaining in the manufacture of the Carnegie wrought steel wheels for heavier service, their design only having been revised in all its dimensions to meet the actual service requirements and to give a minimum weight of metal without sacrificing safety.

PULVERZONE.—The CoKal Stoker Corporation, Wrigley building, Chicago, has issued a bulletin descriptive of its newest type of coal-burning equipment—the Pulverzone. This apparatus combines in one the three approved methods of burning coal: (1) Pulverized coal burning; (2) spread method, and (3) coking method. In this way the Pulverzone is able to burn the smaller lumps and fines in suspension as with powdered coal burning. The heavier coal falls down at the front, while the intermediate sizes are automatically spread over the rear section of the fuel bed. The standard coking method of the CoKal stoker is retained.

WATER AND OIL STANDPIPES.—A graphic method of determining water standpipe capacities is a feature of an attractive 48-page bulletin recently issued by Fairbanks, Morse & Co., 900 S.

Wabash avenue, Chicago. The new method is designed to assist railway water departments in making rapid and simple calculations of standpipe and supply-main sizes, tank heights, etc. It consists of a series of six charts which reduce such calculations to graphic form. Other features of the bulletin include a discussion of the influence of water hammer on standpipe design, a listing of the features of Sheffield standpipes for water and oil service, and 16 pages of engineering data and tables for use in connection with making installations of water-supply systems for standpipe and similar service.

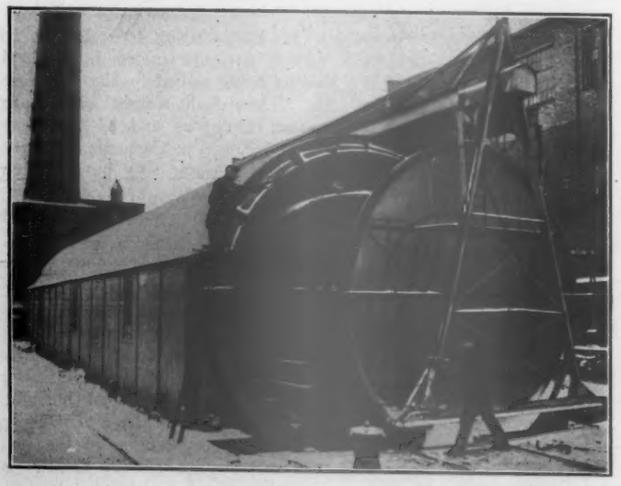
POWER TRANSMISSION.—A new catalogue, containing information pertaining to power transmission and engineering has just been issued by the Hill Clutch Machine & Foundry Company, Cleveland, Ohio. This catalogue, No. 26, is printed in three sections, A, B and C.

Section 26-A illustrates and describes a new flexible coupling of unique simplicity, flanged and compression coupling, shafting and bearings. A large part of this section is devoted to the illustration and description of the Cleveland type oil film bearings, in which the rotating shaft or journal is supported without metallic contact, on a nearly frictionless film of oil. Complete data is given on a heavy duty form of this bearing. Another item in this section is an improved type of clamp for securing bearings to structural steel without the necessity of drilling holes.

Section 26-B covers fully the application of the patented Smith type Hill clutch pulleys and cut-off couplings including quill drives. A complete horsepower table is presented from which friction clutch or plain pulleys may be chosen to meet any requirements. Full data and dimension tables enable the designer to incorporate any of the standard forms of Smith type Hill clutches in power transmission layouts. Following pages take up transmission of power by belting, giving formulas and tables covering the horsepower of leather belting. Applications of belt tighteners to secure maximum horsepower transmitted is discussed in detail. The application of the new Steelarm automatic belt tightener, which provides means of scientifically controlling belt slip, is also described.

Section 26-C illustrates and describes both the American and English systems of rope drives; agitator designs, parts and gearing; forged-cast, iron cast tooth, and cut spur and bevel gears; industrial type speed transformers; and a wealth of pertinent engineering data such as bolt strengths and dimensions, pipe dimensions, threads and tap drills, sheet and wire gages, fusion temperatures, tables of allowable loads on structural shapes, concrete data, trigonometric functions, areas and circumferences of circles, etc.

The three sections of catalogue No. 26 have a total of 258 pages and are substantially bound. Each section is profusely illustrated and line drawings of individual products furnish controlling dimensions of all sizes.



Sterilized transportation—The German State Railways disinfect all of its passenger cars in such chambers as the one shown in the illustration at regular intervals

Personal Mention

General

B. H. GRAY, superintendent of motive power of the Gulf, Mobile & Northern, with headquarters at Mobile, Ala., has been appointed superintendent of motive power of the Jackson & Eastern, with the same headquarters, pursuant to the acquisition of control of this property by the Gulf, Mobile & Northern.

JOHN W. MCVEY, until recently general superintendent of motive power of the Consolidated Railroads of Cuba, has been appointed research engineer in the mechanical department of the Boston & Maine, with headquarters at Boston, Mass. In his new position Mr. McVey will be concerned with general research activities, with the object of securing increased efficiency, and of studying the application of suggestions advanced by employees.

Master Mechanics and Road Foremen

H. M. ODAEE has been appointed master mechanic of the McCook division of the Missouri Pacific.

E. R. DOWDY has been appointed master mechanic of the Chesapeake & Ohio, with headquarters at Richmond, Va., succeeding F. B. Moss, deceased.

G. B. PAULEY has been appointed master mechanic of the Chicago, Burlington & Quincy, with headquarters at Alliance, Nebr., succeeding O. E. Ward.

G. P. TRACHTA, roundhouse foreman of the Chicago, Burlington & Quincy at Kansas City, Mo., has been appointed master mechanic, with headquarters at Omaha, Nebr., succeeding G. B. Pauley.

Shop and Enginehouse

C. W. BUFFINGTON has been appointed general master boilermaker of the Chesapeake & Ohio, with jurisdiction over the system in charge of inspection and maintenance of boilers. Mr. Buffington's headquarters are at Richmond, Va.

Obituary

FRANK A. TORREY, formerly general superintendent of motive power of the Chicago, Burlington & Quincy, who retired on November 1, 1922, after 48 years of railway service, died at his home in LaGrange, Ill., on July 29. He was born in Pennsylvania on October 6, 1856, and entered the service of the Burlington in 1874 as an apprentice in the machine shop at Burlington, Iowa. He was later employed as a locomotive fireman and as a locomotive engineer and was made road foreman of engines in February, 1887. Mr. Torrey was promoted to master mechanic of the Ottumwa division on April 1, 1889, and was transferred to the Creston division in March, 1902. On September 1, 1903, he was made assistant superintendent of motive power, with headquarters at Chicago, and two years later was promoted to superintendent of motive power of the lines east of the Missouri river. Mr. Torrey was appointed general superintendent of motive power of the system on January 1, 1911, and held that position until his retirement.

F. A. Torrey